

#1674
Purch new Henry Radio
May 1956 W6DSX

Collins

75A-4

AMATEUR RECEIVER



INSTRUCTION BOOK

When a new product hits the market, be it an automobile or radio gear, the first question is "what does it have that last year's model didn't have?" The 75A-4 can't sport a 199 horsepower engine, or a panoramic windshield, but it does have a number of new features never before seen on an amateur receiver. One feature, PASSBAND TUNING, is so new that it was necessary to coin a new name to describe its function. Other new features include: separate detectors for SSB and AM reception, a Q-Multiplier Bridge-Tee filter in place of the crystal filter, a new AVC system that works on SSB, a new low cross modulation RF tube, a noise limiter that works on SSB, a built in crystal calibrator, and a new Permeability tuned oscillator--all built into a cabinet nearly 4" narrower than the 75A-3.

This new Ham Band Collins receiver retains many of the timeproven features of the earlier 75A series of sets. These features include: Double conversion, crystal controlled front end for high stability and good image rejection: Permeability tuned, sealed master oscillator for accurate dial calibration and long term stability; and mechanical filters in the IF circuits for the ultimate in selectivity.

It has been said that a ham is a radio manufacturer's most critical customer. A commercial or military customer will generally present a manufacturer with a detailed set of specifications to be met for a specific application. However, each phase of ham radio has its own special requirements, not necessarily compatible. A CW DX man wants very low noise and high selectivity. A phone man wants greater bandwidth with good skirt selectivity and low cross modulation. A single sideband man has his own special requirements for stability, selectivity and ease of tuning. The traffic man wants good dial calibration, stability, and breakin features. The 75A-4 does all this and without compromise.

IFNL QST 6/60 P. 16
CQ 6/60 P. 42
CQ 11/60 P. 62
CQ 11/60 P. 70

Instruction Book

75A-4

AMATEUR-BAND RECEIVER

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COLLINS AMATEUR EQUIPMENT GUARANTEE

The Collins Amateur equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts, or accessories which are defective as to design, workmanship, or materials, and which are returned to Collins at its factory, transportation prepaid, provided:

- (a) Buyer has completed and returned to Collins promptly following his purchase the Registration Card included in the Instruction Book furnished with the equipment.
- (b) Notice of the claimed defect is given Collins within 90 days from the date of purchase and goods are returned in accordance with Collins' instructions.
- (c) Equipment, accessories, tubes, and batteries not manufactured by Collins or from Collins' designs are subject to only such adjustments as Collins may obtain from the supplier thereof.
- (d) No equipment or accessory shall be deemed to be defective if, due to exposure or excessive moisture in the atmosphere or otherwise after delivery, it shall fail to operate in a normal and proper manner.
- (e) Any failure due to use of equipment in excess of that contemplated in normal amateur operations shall not be deemed a defect within the meaning of these provisions.

The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins or its authorized service center.

No other warranties, expressed or implied, shall be applicable to said equipment, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements contained in these paragraphs. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

IMPORTANT! It is necessary that the business reply card included herewith be filled out and mailed to the Company promptly in order for this guarantee to be effective.

HOW TO RETURN MATERIAL OR EQUIPMENT. If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, insofar as applicable. If the item is thought to be defective, such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. (With respect to tubes we suggest that your adjustments can be speeded up if you give notice of defect directly to the tube manufacturer.) Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in handling of your returned merchandise.

ADDRESS:

Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

INFORMATION NEEDED:

- (A) Type number, name, and serial number of equipment
- (B) Date of delivery of equipment
- (C) Date placed in service
- (D) Number of hours of service
- (E) Nature of trouble
- (F) Cause of trouble if known
- (G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
- (H) Item or symbol number of same obtained from parts list or schematic
- (I) Collins' number (and name) of unit sub-assemblies involved in trouble
- (J) Remarks

HOW TO ORDER REPLACEMENT PARTS. When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable. To enable us to give you better replacement service, please be sure to give us complete information.

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Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

INFORMATION NEEDED:

- (A) Quantity required
- (B) Collins' part number (9 or 10 digit number) and description
- (C) Item or symbol number obtained from parts list or schematic
- (D) Collins' type number, name, and serial number of principal equipment
- (E) Unit sub-assembly number (where applicable)

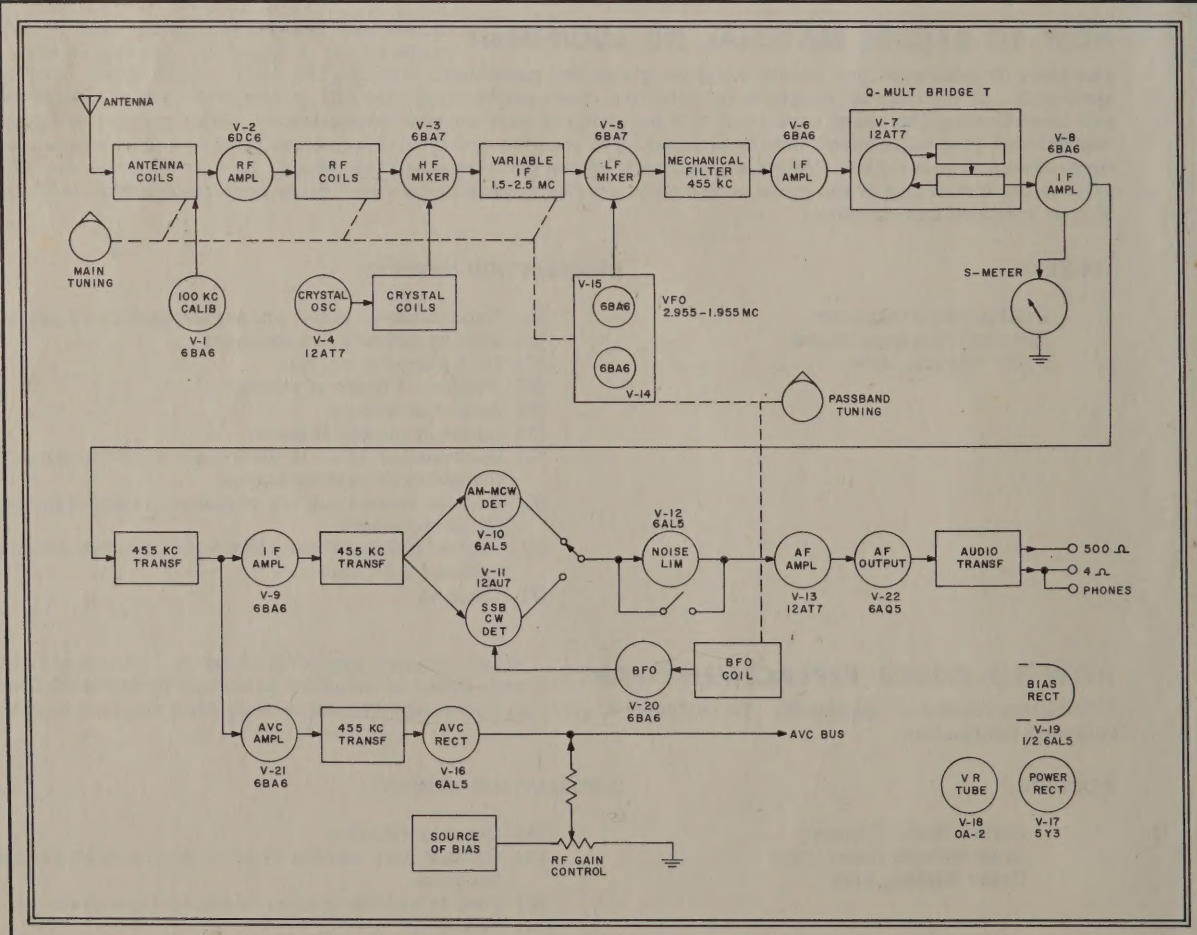
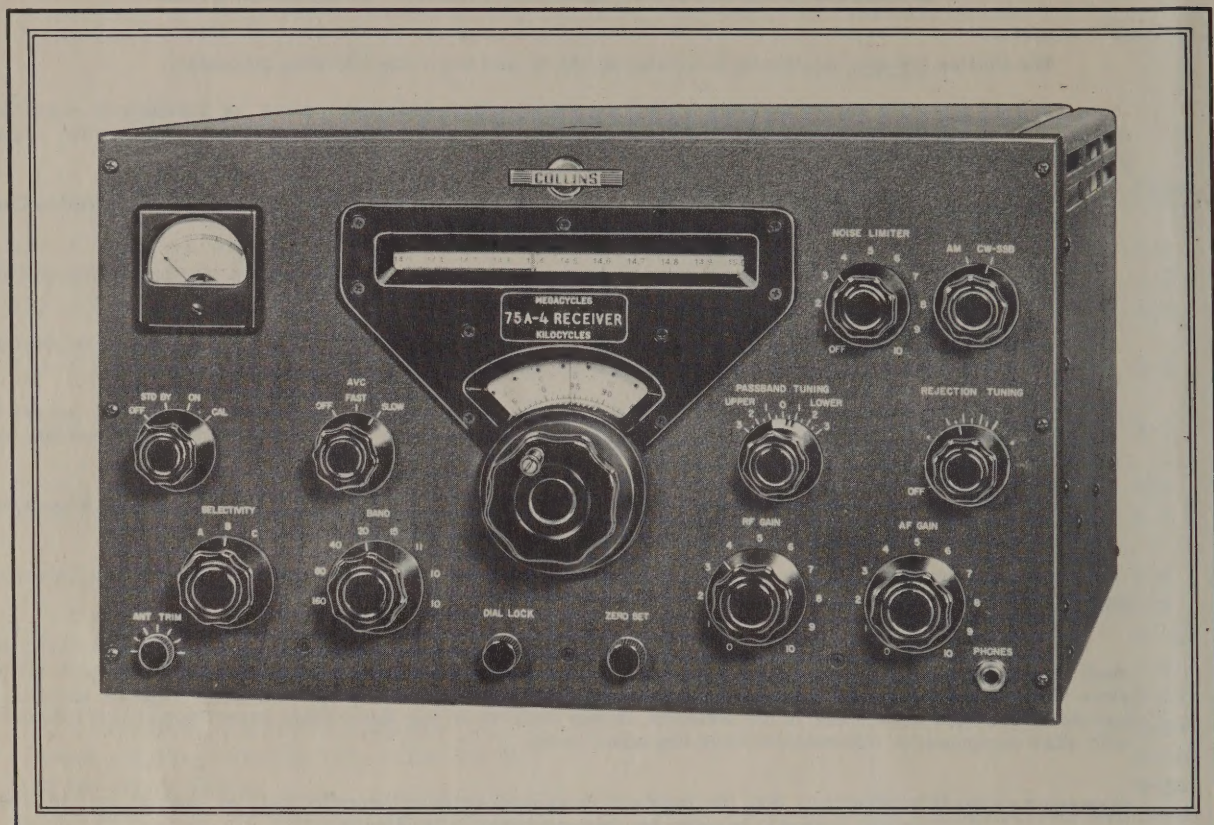


Figure 1-1. 75A-4 Receiver and Block Diagram

SECTION I DESCRIPTION

1. GENERAL.

The Collins 75A-4 receiver is designed primarily for amateur reception on the seven HF amateur bands. It retains many of the time-proven features of the earlier 75A series of receivers. These features include:

- a. Double conversion, crystal controlled front end for high stability and good image rejection even on the 10-meter bands.
- b. Permeability tuned, sealed master oscillator for accurate dial calibration and long-term stability.
- c. Mechanical filters in the IF circuits for the ultimate in selectivity.

2. NEW FEATURES.

Increased amateur activity on single sideband has revealed a need for a receiver designed especially for single sideband reception. The 75A-4 incorporates several new features which considerably improve the ease of reception of a SSSC signal. They include:

a. **DETECTORS.** Separate detectors for double or single sideband signals. The sideband detector is a mixer type detector, which greatly reduces the distortion which is generated when a conventional diode detector is used for detecting a SSSC signal. A diode detector is used for conventional double sideband signals.

b. **AVC.** A fast attack, slow release AVC system is fast enough to respond to the first few cycles of a sideband transmission and does not require the presence of a carrier for operation. A fast and slow release time are available on a panel switch. The "fast" is used normally for AM reception. The "slow" is used during sideband and CW reception and prevents the receiver from "opening up" between words and characters.

c. **PASSBAND TUNING.** A passband tuning system is used in the 75A-4. In this system the receiver BFO is mechanically ganged and tracked with the main tuning dial. Once a SSSC signal is tuned in, it can be moved relative to the passband of the receiver without losing intelligibility of the signal. This feature is especially useful for "switching" sidebands and for dodging interfering signals. In CW reception, the desired signal can be moved around in the passband without changing the pitch of the received beat note, and at the same time, interfering signals can be pushed off the edge of the passband.

d. **"Q" MULTIPLIER.** A combination "Q" multiplier and bridge T-filter are used in the 75A-4. This circuit replaces the conventional crystal filter and has several features which make it superior to the crystal filter. It has a deep, narrow notch which has equal effectiveness anywhere in the passband. Conventional crystal filters become inoperative at frequencies several hundred cycles on either side of the resonant frequency of the crystal. The "Q" multiplier does not seriously distort the shape of the IF passband as does a crystal filter. This results in much less loss of intelligibility while still doing a superior job of eliminating heterodynes.

e. **MECHANICAL FILTERS.** Space has been provided for 3 mechanical filters. This allows the operator to tailor his set to his requirement. An 800-cycle filter is available for CW use and a 6-KC filter for double sideband AM reception. The 75A-4 is normally supplied with one 3-KC filter as standard equipment.

f. **NOISE LIMITER.** A new noise limiter circuit which is effective on AM, CW or SSSC signals is used in the 75A-4. This limiter is designed to clip both the positive and negative peaks of the detected signal. By means of a panel control the operator can select the degree of clipping desired.

g. **CRYSTAL CALIBRATOR.** A crystal calibrator circuit is an integral part of the 75A-4. No adapters are needed. Calibration signals are present every 100 KC at the flip of a panel switch.

Section I
DESCRIPTION



Figure 1-2. Type F-455J Plug-in Mechanical Filter.

3. SPECIFICATIONS.

<u>Frequency Range:</u> -	<u>Band</u> <u>(meters)</u>	<u>Range</u> <u>(mc)</u>
	160	1.5 to 2.5
	80	3.2 to 4.2
	40	6.8 to 7.8
	20	14.0 to 15.0
	-15	20.8 to 21.8
	11	26.5 to 27.5
	10	28.0 to 29.0
	10	29.0 to 30.0

- Size: - 10-1/2" high x 17-1/4" wide x 15-1/2" deep.
- Weight: - 35 pounds.
- Finish: - St. James gray wrinkle enamel.
- Cabinet: - Table mounted with provision for relay rack mounting.
- Power Input: - 105-125 volts AC, 50-60 cps; 85 watts.

Number of Tubes: - 22, including rectifier and voltage regulator tubes

Types of Reception: - AM, CW, SSB, MCW.

Sensitivity: - 1.0 microvolt for 6 db signal-to-noise ratio with 3 KC bandwidth.

Antenna Input: - Accommodates wide range of antenna impedances; designed for 50-150 ohms terminal impedance; coax connector provided.

Selectivity: - The selectivity is determined entirely by the choice of mechanical filters. Provision is made for use of three filters. Filters are available in bandwidths of 0.8 KC, 3.1 KC and 6 KC. Use only the filters here listed: F-455J-05 (Part No. 526 9154 00) for 500 cps; F-455J-31 (526 9089 00) for 3.1 KC; F-455J-60 (526 9091 00) for 6 KC. Receiver supplied with 3.1 KC filter (F-455J-31).

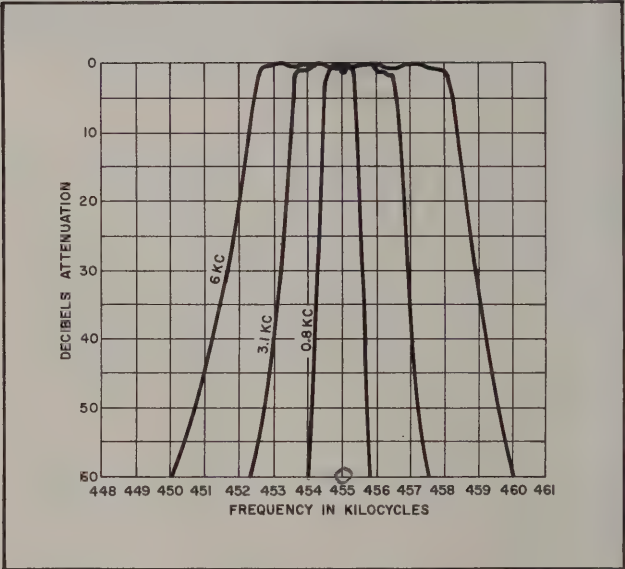


Figure 1-3. 75A-4 Selectivity Curves

AVC Characteristics: - Audio rise less than 3 db for inputs of 5 to 200,000 uv.

AVC Time Constants: -

	<u>Fast</u>	<u>Slow</u>
Rise Time	.01 sec.	.01 sec.
Release Time	.1 sec.	1 sec.

IF and Image Rejection: - All greater than 50 db down.

Audio Characteristics: -

Output - .75 watts with a 3.0 uv signal, 30% modulated.
Output impedance - 500 ohms, 4 ohms.
Response of audio circuits - ± 3 db 100 cps to 5000 cps.
Distortion - Less than 10%.

Noise Limiter: -

AM - Adjustable clip point, automatic carrier reference.
CW-SSB - Adjustable clip point. Clip reference controlled by flat AVC.

Muting: - Provisions for muting the receiver during key-down operation is provided. A muting voltage of +20 volts must be supplied by the transmitter or a separate contact on a keying relay and a 20 volt "B" battery.

Frequency Stability (at 14.5 mc): -

Temperature - Not more than 1200 cycles drift, from 0 degrees to +60 degrees centigrade.

Warmup - After 30-minute warmup, drift during any 10-minute period does not exceed 100 cps.

Voltage - For line voltage changes of $\pm 10\%$, the frequency does not change more than 100 cps.

Humidity - For humidity changes of from 0 to 90%, the frequency does not change more than 50 cps.

Dial Accuracy - (After calibration)

All Bands - ± 300 cps.

4. ACCESSORIES.

In addition to the mechanical filters listed in paragraph 3 above, the following accessories are available:

Speaker - 10" speaker in matching cabinet, speaker cabinet 15" wide, 11-1/8" high, 9-1/8" deep. Type No. 270G-3. Part No. 522 0149 00.

Rack Mounting Bracket Assembly: - To adapt the receiver for standard relay rack mounting. St. James Gray wrinkle finish. Part No. 540 4628 00.

SECTION II INSTALLATION

1. UNPACKING.

Open packing cartons carefully to prevent damage to the equipment. Remove packing material and remove the equipment from the cartons. Search the packing material for small packages. Inspect the receiver for loose screws and bolts. Check all knobs, switches, etc., to see that they operate properly. Any claims for damage should be filed promptly with the transportation company. If a claim is to be filed, the original packing case must be preserved. See instructions on back of the bill of lading.

2. EXTERNAL CONNECTIONS (See figure 2-1).

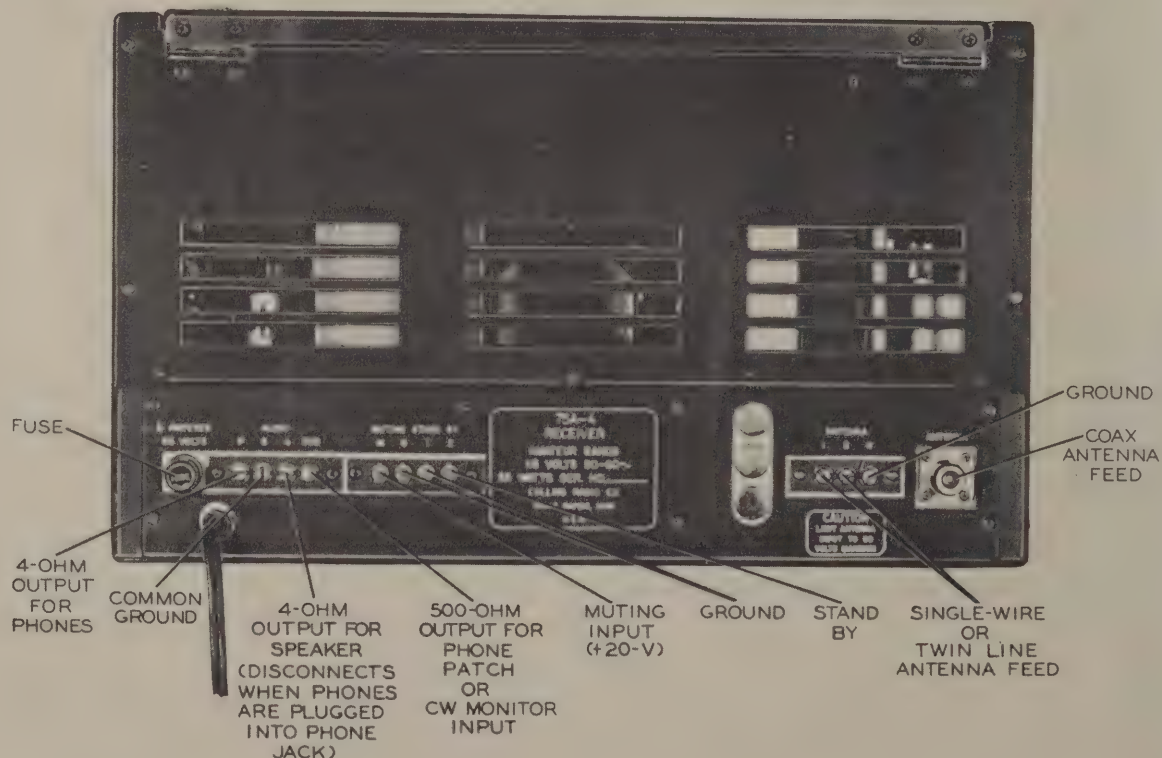
a. ANTENNA AND GROUND. The antenna connector strip is located at the rear of the chassis on the right-hand side. Balanced antennas should be connected to terminals 1 and 2. When a balanced antenna is used, grounding terminal G may introduce noise. Therefore, to determine the more satisfactory arrangement, try the receiver both

with and without an external ground. A single-wire antenna should be connected to terminal 1 with terminals 2 and G connected together and grounded.

b. COAXIAL ANTENNA CONNECTION. The 75A-4 is provided with a UG-1094/U receptacle and UG-260/U plug for use with coaxial cable antenna input. Jumper terminal 2 of the antenna connector strip to G. Figure 5-8 shows the proper method for assembling plug UG-260/U to RG-58/U cable.

CAUTION

Do not subject the antenna input to RF exceeding 50 volts. Excessive RF voltages may be encountered if the receiving antenna is not disconnected when the transmitter is operating. Excessive capacity coupling across contacts of the antenna change-over relay may also result in excessive RF voltage when the transmitter is operating. If an RF voltmeter is not available, a small neon bulb connected at the receiver terminals will serve as an indicator of harmful RF voltage.



c. OUTPUT CONNECTIONS.

(1) SPEAKER. The output connections are on the rear of the chassis at the left-hand side. Terminals G and 4 are for connection to a speaker voice coil. This output is open circuited by the headphone jack on the front panel so that plugging in headphones disables the speaker.

(2) HEADPHONES. In addition to the front-panel jack, a pair of terminals marked G and P is provided for rear-chassis headphone connection. This output is connected to the 4-ohm tap on the output transformer and is not open circuited by the front-panel jack.

d. 500-OHM OUTPUT. These terminals may be used to feed a transmitter or telephone line for phone patch, or may be connected to a sidetone oscillator or monitor.

e. STANDBY. The standby terminals, marked 1 and 2, are located at the rear of the chassis on the center terminal strip. These terminals are across a blocking bias resistor and are in parallel with contacts on the OFF-STANDBY-ON CAL switch. The terminals may be connected to contacts of a send-receive relay for external standby control. With the OFF-STANDBY-ON CAL switch in STANDBY position, closing the standby circuit will allow the receiver to operate. Opening the standby circuit will disable all tubes which are connected to the AVC line.

f. MUTING. Terminals M and G on the center terminal strip at the rear of the chassis are provided for connection to a source of muting voltage for break-in CW operation. This source must be capable of delivering +20 volts to the terminals for key-down muting and 0 volts key-up. The Collins 32V-1, 32V-2, and KW-1 transmitters provide a muting voltage.

The muting voltage may be obtained from the cathode resistor of a keyed stage which is biased to cutoff during key-down conditions, from a resistor in series with a cathode-keyed stage, or from a battery in series with auxiliary contacts on a keying relay. Terminal G must be connected to a point of ground potential and terminal M to the source of positive voltage.

NOTE

Neither the disabling nor the muting circuits provide protection to the antenna input circuit. See part 2 of this section, paragraph b.

g. POWER. The receiver must be powered from a 115-volt, 50/60 cps source.

h. FUSE. The fuse is in an extractor-type fuse post located on the rear of the chassis near the left-hand corner. To remove the fuse, push in the fuse-post cap, turn it counterclockwise, and pull straight out. Use only a 2-ampere fuse.

3. INSTALLATION OF MECHANICAL FILTERS.

If the receiver was shipped with the mechanical filter (or filters) removed, open the receiver lid and loosen the filter clamp wing nut and remove the clamp. Plug the filter all the way in (very important to prevent feedthru) and replace the filter clamp. Shove the clamp down tightly and tighten the wing nut. Use socket B for 3 KC, socket A for 800 cps, and socket C for 6 KC filters.

4. "S" METER ADJUSTMENT.

Set up the receiver for AM operation (section III, part 2), short the antenna input connections, and set the ZERO-ADJUST Control, located on top of the receiver chassis, for an "S" meter reading of 0.

NOTE

The METER SENSITIVITY Control is set at the factory by injecting a 100 uv, 3.7 MC signal into the ANT input and adjusting for an S-9 reading of the "S" meter.

5. ADJUSTMENT OF CALIBRATION OSCILLATOR.

Turn the set on and allow it to warm up for about 20 minutes. During this 20-minute period, read Section III OPERATION and tune around the bands and get the "feel" of the set. After the set is warmed up, tune in a signal of known accuracy (WWV at 2.5, 15, or 30 MC is suggested). Turn the OFF-STANDBY-ON CAL Control to CAL, switch to AM and center the PASSBAND TUNING knob. If an audible beat note is heard, lift the receiver lid and locate the CAL adjusting capacitor in the left-hand, rear corner of the chassis. Be sure not to confuse the tone modulation, when present, on WWV with the beat note. Turn this capacitor until zero beat is obtained. The calibrator is now adjusted. Check for a signal at several 100-KC points on the tuning dial.

6. USE OF EXTERNAL SIDEBAND SELECTING DEVICES.

Do not use the 75A-4 with external sideband selecting devices. These arrangements which have become popular for single sideband reception with other types of receivers should not be employed

with the 75A-4. These devices were intended to provide rejection of an unwanted sideband, selection of either sideband, and carrier reinsertion. Each of these functions is performed by the normal circuitry of the 75A-4 and in a more convenient and effective manner than would be accomplished with such devices.

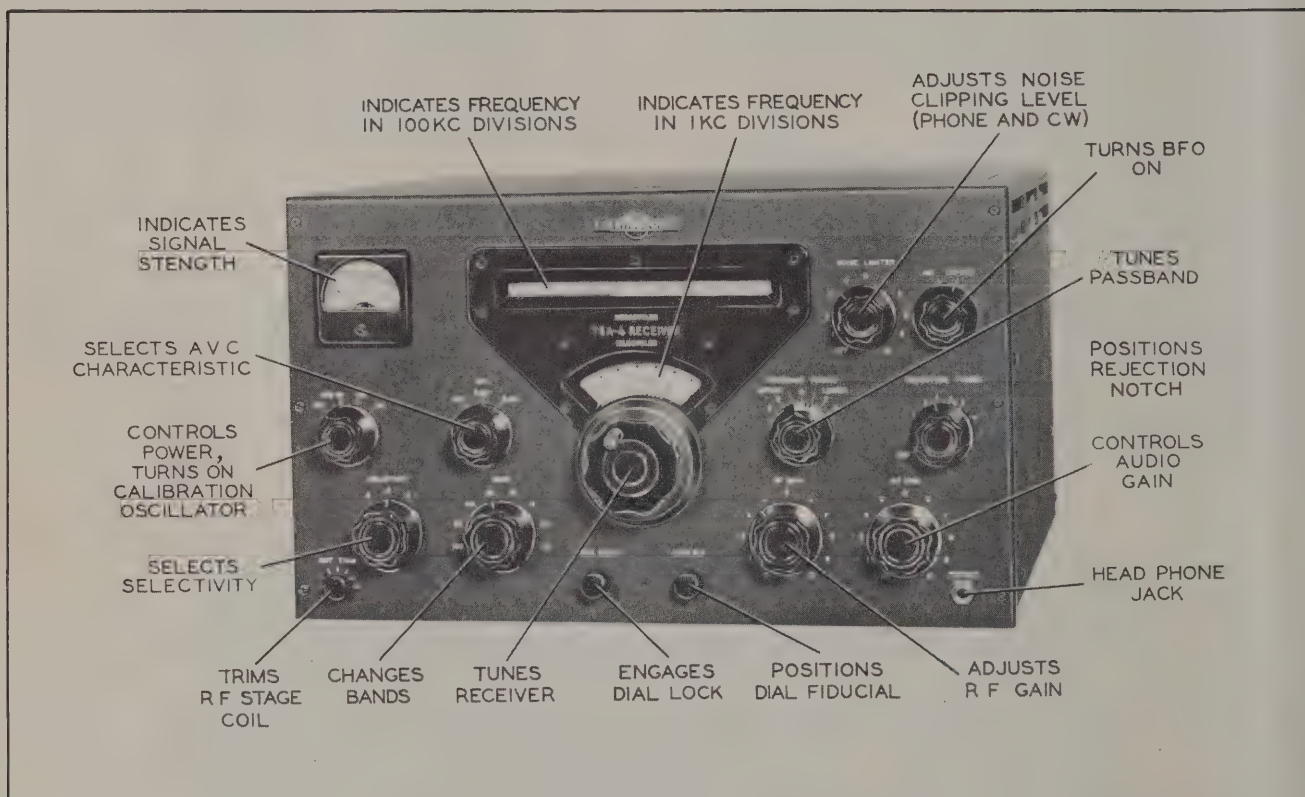


Figure 3-1. 75A-4 Operating Controls

SECTION III OPERATION

1. CONTROLS.

a. OFF-STANDBY-ON CAL. This switch turns the receiver power on and off and in STANDBY position allows filament and plate voltages to remain on but disables the receiver. In the CAL position, plate and filament power remain on and B+ is applied to the calibration oscillator. In STANDBY position, a resistor, R-98, is inserted in series with the bias load resistors to increase the bias voltage to cutoff on the output tube and the AVC controlled tubes. Standby terminals 1 and 2 on the rear of the chassis are connected across R-98 to allow the use of an external send-receive switch or relay to control the standby function. This connection would be effective with S-6 in STD BY position.

b. BAND CHANGE. This switch is used to select the desired amateur band. Turning the control knob turns the shaft of the band switch and at the same time rotates the dial drum so that the scale in use is visible through the MEGACYCLES window. The 10-meter band occupies 2 positions of the switch; all other bands one position.

c. MEGACYCLES - KILOCYCLES. The main tuning dials are a slide-rule MEGACYCLES dial and circular KILOCYCLES dial. The MEGACYCLES dial is calibrated in 100-KC divisions on each scale. The scale for each band is 1 megacycle wide. The KILOCYCLES dial is calibrated in 1-KC divisions. The KILOCYCLES dial has two scales; the lower scale is black, and is calibrated in 1-KC divisions for 80-10 meters; and the upper scale, also marked in 1-KC divisions, is red, and is used on 160 meters. The 160-meter scale is separate from the black scale because kilocycle readings on this band run in the opposite direction from those on the other bands.

Scales on the MEGACYCLES dial are colored to correspond to the colors on the KILOCYCLES dial.

The frequency at which the receiver is set is determined by combining the readings of the two dials. For example, if the MEGACYCLES scale reads 3.8 plus and the KILOCYCLES scale reads 52, the receiver is tuned to 3852 KC; or if the MEGACYCLES dial reads 28.6 plus and the KILOCYCLES

dial reads 32, the receiver is tuned to 28,632 KC. For frequency measuring procedures, refer to part 9 of this section, FREQUENCY MEASURING.

d. AM CW-SSB. In the CW-SSB position this switch turns on the BFO selects the CW-SSB detector V-11, and puts fixed operating bias on the noise limiter. In the AM position, this switch turns off the BFO, selects the AM-MCW detector, and removes the fixed bias from the noise limiter and connects the noise limiter to the carrier source of bias.

e. SELECTIVITY. This control selects the sockets into which the mechanical filters are inserted. It is suggested that the 3-KC filter be inserted into socket B, socket A be reserved for an 800-cps filter, and socket C be reserved for a 6-KC filter. The panel is marked to conform with the socket lettering.

f. RF GAIN. This control is used to set the maximum RF and IF gain of the receiver so that the AVC will not increase the gain excessively between characters in CW or between words and syllables in SSB reception. The 75A-4 should always be used with AVC for all types of signals. The AVC OFF position is provided merely for test and special purposes. The RF GAIN Control is normally set so that the S meter "kicks up" about three S points or 20 db during keying or SSB reception. Adjustment of the RF GAIN Control does not disturb the reading of the S meter provided it is set so that the S meter rises in the presence of a signal. For exact tuning and operating procedures, refer to parts 2-8 of this section.

g. AUDIO GAIN. This control is used to adjust the gain of the first audio stage. It should be employed to adjust the loudness or volume of the receiver. The RF GAIN Control should not be used for this purpose either on CW or voice reception.

h. PASSBAND TUNING. The shaft of this control is connected directly to the BFO tuning condenser and is connected by a belt drive to the frame of the master oscillator (KILOCYCLES tuning). Its function is explained in part 7.

Section III OPERATION

i. **ANT. TRIM.** This control should be adjusted for maximum RF gain each time a different band is used. The control shaft is coupled to a trimmer capacitor across the RF coil for the band in use and is used to compensate for changes in antenna characteristics from one band to another.

j. **NOISE LIMITER.** The noise limiter functions for both AM and CW-SSB operation. The NOISE LIMITER is out of the circuit when the control is in the OFF position. When the control is advanced from the OFF position, the noise limiter is connected into the circuit. Advancing the control toward higher numbers increases the noise limiting action on both AM and CW-SSB. Use the noise limiter on phone only when the need arises because, as with all noise limiters, some distortion is introduced with its use.

k. **AVC.** The AVC Control can turn off the AVC altogether or it can select either fast release or slow release AVC characteristics. In both cases the AVC is fast attack, the release time being the selectable characteristic. The FAST position is used for AM operation. The SLOW is used for SSB operation and for CW operation because it prevents the receiver from "opening up" between words or CW characters.

l. **REJECTION TUNING.** This control takes the place of the usual crystal filter phasing control. In operation, it is much more effective than the crystal filter phasing control in reducing heterodyne interference. The control tunes the rejection filter through the entire receiver passband. To remove the filter from the circuit, turn the control to OFF. See part 8 for operational procedures.

m. **ZERO SET.** Rotating the ZERO SET knob moves the indicator line on the KILOCYCLES dial. This adjustment allows exact calibration of the KILOCYCLES dial on a signal of known frequency. Calibration procedures are described in part 9 of this section, FREQUENCY MEASURING.

n. **DIAL LOCK.** This knob locks the KILOCYCLE dial when desired. It should be unlocked for all normal tuning procedures.

2. TUNING AM SIGNALS.

The tuning techniques used with a 75A-4 receiver when employing the 3-KC filter differ somewhat from those used in tuning a conventional receiver. Because of the flat top and almost vertical sides of the passband, it is possible to tune either sideband of an AM station and reject the opposite sideband.

Tuning "on the nose" results in loss of the high frequency audio components with a loss of intelligibility. Select the sideband that contains the least objectionable adjacent channel interference. Use the following procedure to tune AM signals.

a. Setup for AM reception. Power on. Operate BAND CHANGE switch to desired band. Select 3-KC mechanical filter. RF GAIN maximum. Use AUDIO GAIN for volume control. Set for FAST AVC. Set PASSBAND tuning for LOWER sideband as described below.

NOTE

Tuning is reversed on 160 meter band. Set PASSBAND knob at UPPER to receive lower sideband, etc.

b. Tune in AM station for maximum S meter reading.

c. Adjust antenna trim for maximum S meter reading. (One setting for each new band usually sufficient.)

d. Tune the receiver counterclockwise (clockwise on 160 meters) or to low frequency side of the signal until the S meter reading drops sharply. Then back up the tuning until the S meter reading just regains its former value and the modulation is readable. The receiver is now tuned to accept the lower sideband and the carrier of the AM station. If interference is present, it may be possible to avoid it by setting the PASSBAND TUNING to accept the carrier and the upper sideband. The same result can be obtained by adjustment of the main tuning control except that if the main tuning control is used for this purpose instead of the PASSBAND TUNING, the dial will no longer read the exact carrier frequency of the received signal.

e. If impulse noise is severe, advance the NOISE LIMITER Control from the OFF position far enough to reduce the impulse noise but not so far as to distort the modulation appreciably.

f. If heterodyne interference is bad on both sidebands, tune to the better sideband. Operate the REJECTION TUNING Control over its entire range (90° either side of center position) to find the position at which the heterodyne is weakest.

g. If interference is not severe, some improvement in reception may be experienced by switching to the 6-KC mechanical filter if one is available.

When the 6-KC mechanical filter is used, the PASS-BAND TUNING should be centered and the receiver should be tuned to place the carrier in the center of the passband.

3. TUNING SINGLE-SIDEBAND SIGNALS.

a. Setup for CW-SSB reception. Operate BAND CHANGE switch to desired band. Select 3-KC mechanical filter. RF GAIN 8 to 10. AUDIO GAIN for normal volume of about 2. AVC - SLOW. PASSBAND TUNING set for desired sideband. Usual amateur practice is to employ the lower sideband on the 4 and 7 bands and the upper sideband on the 14, 21, and 28 mc bands. Occasionally amateurs do not follow this rule, in which case it will be necessary to switch sidebands by resetting the PASSBAND TUNING accordingly. On 160 meter band, set PASS-BAND TUNING to LOWER to receive upper sideband and to UPPER to receive lower sideband.

b. Tune in SSB station very slowly until signal is readable. Some care is necessary in the final adjustment of tuning in order to set the frequency sufficiently accurately to make the voice sound entirely natural.

c. If the signal cannot be made readable, turn PASSBAND TUNING to the other side of zero and repeat the tuning procedure.

d. Readjust the RF GAIN Control until the S meter kicks up not to exceed three S points or 20 db with the voice modulation. If the S meter kicks much more than this with the modulation, a popping or pumping effect will be observed due to the necessary attack time of the AVC. The RF GAIN Control can be set so that the S meter does not kick up, but if this is done a weaker station breaking in on the same frequency may not be received.

e. The PASSBAND TUNING can be displaced slightly from its normal setting from either the upper or lower sideband in order to minimize interference which may be present at the edges of the sideband. The NOISE LIMITER can also be used to reduce impulse noise interference.

4. TUNING CW SIGNALS.

The receiver is set up for CW reception in exactly the same way as it is set for SSB reception. Namely, set switch for CW-SSB, power on. BAND CHANGE switch to desired band. Select 3 KC mechanical filter. RF GAIN 8-10. AVC-SLOW. AUDIO GAIN for desired headset or speaker volume.

a. Set PASSBAND TUNING in the normal position for either sideband (not centered).

b. Tune CW station to give a beat note of 1000 to 1500 cycles.

c. If the CW station is being interfered with, turn PASSBAND TUNING one way or the other to drop off interfering station and to retain the wanted station.

d. The REJECTION TUNING may also be used to eliminate an interfering station.

e. If an 800-cycle filter is available, it may be selected and the PASSBAND TUNING readjusted to place the signal in its narrow passband and to accomplish a further reduction of interference and noise.

f. The NOISE LIMITER can be advanced to reduce impulse noise interference.

g. The RF GAIN Control can be adjusted so that the S meter kicks up only sufficiently to provide an S meter reading during keying and so that the gain of the receiver does not recover excessively between characters. Some AVC action should be retained, however, in order to make sure that a weaker breaking station will be heard.

5. LOCALLY REINSERTED CARRIER.

Locally reinserted carrier technique can be employed to advantage where selective fading is causing difficulty in reading an AM signal. The tuning procedure eliminates the station's carrier and substitutes the 75A-4 BFO for use as steady source of carrier power. Combining the station's sideband with the BFO carrier in the 75A-4 receiver produces the intelligible signal. Proceed as follows:

a. Set receiver up for SSB reception and tune the signal for greatest intelligibility as in SSB reception. (See part 3 of this section.)

6. SINGLE-SIDEBAND AM RECEPTION.

Some AM transmitters employ only one sideband. This is accomplished with a single-sideband transmitter by reinserting carrier after phasing out or filtering out one of the sidebands. It has the advantage of permitting reception on an ordinary AM receiver and at the same time occupying only half the spectrum space of an "old-fashioned" double-sideband AM transmitter. The disadvantage, of course, is that the full power of the transmitter

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can not be employed in the voice sideband and also that a carrier, which may produce continuous interference, is transmitted. Single-sideband AM signals of this type can be received with the 75A-4 receiver set for AM, except that the receiver must be adjusted to correspond to the sideband being transmitted.

7. PASSBAND TUNING.

Previous receivers have been inconvenient to tune for CW or SSB reception because there has been no way of varying the position of the passband without at the same time disturbing the frequency of the beat note. It is, of course, necessary to have a BFO correctly positioned in respect to the passband in order to obtain proper voice reception in the case of SSB, and in order to obtain a suitable beat note in CW reception while at the same time accepting the desired signal and rejecting others. This difficulty in tuning conventional receivers has been aggravated by the fact that the BFO tuning usually was not accurately calibrated and many BFO's were subject to drift and instability. The 75A-4 overcomes these difficulties through the use of a stable, temperature-compensated and calibrated BFO arranged with a mechanical linkage to the VFO tuning. The PASSBAND TUNING Control varies the frequency of the BFO and at the same time produces an equal and opposing change in the VFO frequency by rotating the case of the VFO. Since the tuning of both oscillators is linear, it is possible to make this tuning track closely at all points. The net effect, then, of turning the BFO tuning control is to maintain the reinserted carrier (BFO injection) frequency unchanged relative to the received signal, but at the same time to change the tuning of the receiver in respect to the IF passband. In this way it is possible to use the main tuning control to "zero in" on an SSB signal or to adjust a CW beat note to the desired frequency and then to use the PASSBAND TUNING Control to select the desired sideband in the case of SSB or to dodge interference in the case of CW without disturbing the beat frequency.

Use of the PASSBAND TUNING Control has been described in the preceding sections. Once its purpose and method of operation is understood, its use will become second nature. It will be observed that the PASSBAND TUNING knob has a white sector which spans approximately 3 KC of the panel calibration. It thus forms a graphic representation of the passband displayed against the panel calibration with zero representing the position of the carrier frequency. The smaller black sector in the middle of the white sector represents the width of an 800

cycle filter and thus the same picture is presented when this narrower filter is employed in CW reception.

It is important when first placing the receiver in operation and at occasional intervals thereafter to check the calibration of the BFO to make sure that it is correctly set. The calibration adjustment can be accomplished most readily as follows:

- a. Set PASSBAND TUNING on center.
- b. Tune the receiver to a calibration check point on one of the higher frequency bands. Adjust for zero beat.
- c. Rotate the PASSBAND TUNING each way until the S meter drops about three S points or 20 db and note the position of the center index mark on the PASSBAND TUNING knob at which this drop is obtained. A 20 db reduction in S meter reading should occur symmetrically on each side of zero and at about 1.5 KC as indicated by the line in the center of the white sector on the knob (using a 3 KC filter). If the drop off is not symmetrical, remove the plug from the top of the BFO can and make a small change in the setting of the adjustable slug. Retune the main tuning for zero beat and see if the drop off points are more symmetrical around zero than before. Repeat until the correct setting of the inductance slug is found. Ordinarily this adjustment would not be needed or, at most, very infrequently. Complete BFO alignment procedures are given in section V, part 7.

The PASSBAND TUNING Control, of course, serves as a "sideband switch." Positioning the white sector either side of zero serves to select either the upper or lower sideband without retuning the receiver.

8. REJECTION TUNING.

This control is used to minimize interference caused by heterodynes. It is usually placed in the OFF position until a heterodyne is experienced. Tune the REJECTION TUNING very carefully until the most bothersome heterodyne is eliminated or greatly attenuated. When the UPPER sideband is being received, low frequency heterodynes will be attenuated in the region left of center mark. High frequency heterodynes will be attenuated in the region right of the center mark. When the LOWER sideband is being received, low frequency heterodynes will be attenuated in the region right of center and high frequency heterodynes to the left of center. The null for any audio tone is very sharp so the knob must be moved very slowly.

9. FREQUENCY MEASURING.

The KILOCYCLES dial reads the true carrier frequency if the station is tuned to zero beat.

NOTE

See part 5 of section II for calibration oscillator adjustment.

a. Calibration: Frequency readings will be more accurate if the calibrator is used to calibrate the dial before frequency measurements are made. To use the calibrator, set up for CW reception (part 4 of this section), tune to the 100-KC point nearest

the frequency to be measured, set the PASSBAND TUNING Control to center position, and turn on the calibrator. Zero beat the calibrator signal, using the main tuning control. Adjust the ZERO SET knob so that the dial marker lines up with zero on the KILOCYCLES dial. Turn off the calibrator.

b. To measure the carrier frequency of an AM station, select CW operation, set PASSBAND TUNING to 0, tune the station for zero beat, and read the frequency on the tuning dial.

c. With the single-sideband station properly tuned in the suppressed carrier frequency is the KILOCYCLES dial reading.

SECTION IV THEORY OF OPERATION

1. GENERAL

Refer to the block diagram of figure 1-1. The 75A-4 amateur band receiver is a dual conversion receiver on all bands except 160 meters where single conversion is employed. The dual conversion scheme employs a fixed high frequency oscillator, crystal controlled, and a variable first intermediate frequency. The signal from a type 70E-24 VFO is beat against the variable IF to produce a fixed 455 KC second intermediate frequency. One stage of RF amplification is employed in the receiver. The passband of the fixed IF (455 KC) is shaped by a mechanical filter stage. A "Q" multiplier stage provides a tunable notch to minimize heterodyne interference. Two more 455 KC IF stages follow the "Q" multiplier. These feed separate detectors for AM or CW-SSB reception. The output of the detectors feed a combination AM and CW type adjustable noise limiter. Three stages of audio amplification follow. The output stage feeds a headset jack and a 500-ohm load or a 4-ohm speaker. A separate AVC amplifier and rectifier are used. Bias for the audio output tube and the RF gain control system is obtained from a separate rectifier. A built-in 100-KC calibration oscillator is included in the set. The passband tuning feature is accomplished by gang tuning the BFO and variable frequency oscillator by means of a metal belt.

2. TUNING.

All variable tuned stages including the RF stage, the first mixer, the variable IF system and the variable frequency oscillator are operated by the KILOCYCLES dial. This dial is coupled directly to the shaft of the variable frequency oscillator. All other variable tuned circuits just mentioned are tuned by a common platform to which powdered iron slugs are attached. The platform is moved up and down at a linear rate by means of a mechanism which is coupled to the VFO shaft by a system of split gears and metal belts. The receiver uses a unique method of band switching in the RF stage in which only the 80-meter (T-2) and the 160-meter (T-1) coils are tuned by the main tuning mechanism, and coils for 40-10 meters are selected and connected across the 80-meter coil. Varying the inductance of

the 80-meter coil varies the total inductance, and therefore the resonant frequency of the tuned circuit in use.

3. RF CIRCUITS.

A simplified block diagram of the 75A-4 RF system is shown in figure 4-1. The RF stage V-2 feeds the mixer at the carrier frequency of the incoming signal. The coverage of each band is as follows:

160 meters -	1.5 -	2.5 MC
80 meters -	3.2 -	4.2 MC
40 meters -	6.8 -	7.8 MC
20 meters -	14.0 -	15.0 MC
15 meters -	20.5 -	21.5 MC
11 meters -	26.5 -	27.5 MC
10 meters -	28.0 -	29.0 MC
	29.0 -	30.0 MC

The first conversion circuit, consisting of a crystal controlled oscillator, V-4 and a mixer tube, V-3, converts the incoming signal to the variable IF frequency of 2.5 to 1.5 MC for all bands from 80 meters thru 10 meters. The variable IF is mixed with a signal from the VFO, V-14 and V-15, in the second mixer V-5 where it is converted to a fixed IF of 455 KC. See figure 5-7. A discussion of the individual circuits in the RF portion of the receiver follows:

a. RF STAGE. The RF stage uses a 6DC6 pentode. This tube was chosen because of its low-noise, remote-cutoff characteristics. This tube allows greater grid voltage swing without cross-modulation distortion. Individual variable slug-tuned coils are switched into the grid circuit on 160 and 80 meters. On 40-10 meters the coil in use is switched across the 80-meter coil, and varying the inductance of the 80-meter coil tunes the coil for the band in use. The 80-meter trimmer capacitors are not in the circuit on 40-10 meters.

One coil, T-7, is used for the 11 and 10-meter bands. Manual tracking is used here employing the ANT TRIM capacitor, C-18. Separate antenna coils are employed on the 10-11-meter coil, the 80-meter coil, and the 160-meter coil.

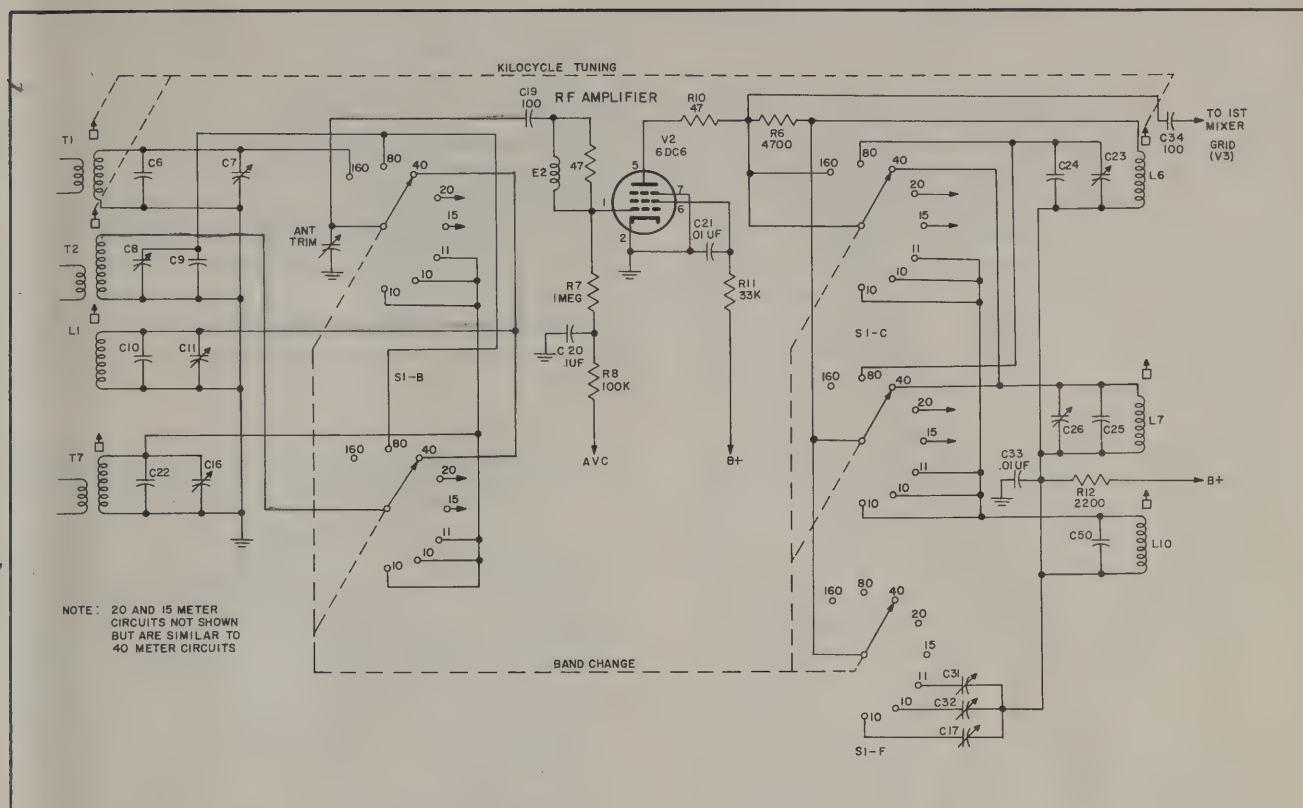


Figure 4-1. Tuning Elements of RF and Mixer Stages, Simplified Diagram

The 160-meter band feeds on thru the first mixer, V-3, into the 2.5 to 1.5 MC variable IF coils, which track with the receiver front end, and on into the second mixer V-5. On 80, 40, 20, 15 and the highest frequency 10-meter band the first mixer grid circuit is similar to the RF stage grid circuit with the higher frequency coils being

paralleled with the 80-meter coil to produce the tuning for the band in use. On the low 10-meter band and the 11-meter band, capacitors C-32 and C-31 are individually selected to pad the 10-meter coil to these bands. The following table shows the tuning components used in the various bands for each tube circuit.

BAND (METERS)	ANT L	ANT C PAD	ANT C TRIM	RF L	RF C PAD	RF C TRIM	OSC L	OSC PAD
160	T-1	C-6	C-7 C-18	-	-	-	-	-
80	T-2	C-9	C-8 C-18	L-6	C-24	C-23	L-12	C-40
40	L-1 (T-2)	C-10	C-11 (C-18)	L-7 (L-6)	C-25	C-26	L-13	C-41
20	L-2 (T-2)	C-12	C-13 (C-18)	L-8 (L-6)	C-27	C-28	L-14	C-42
15	L-3 (T-2)	C-14	C-15 (C-18)	L-9 (L-6)	C-29	C-30	L-15	C-43
11	T-7 (T-2)	C-22	C-16 (C-18)	L-10 (L-6)	C-50	C-31	L-16	C-44
10 LO	T-7 (T-2)	C-22	C-16 (C-18)	(L-10) (L-6)	C-50	C-32	L-17	C-45
10 HI	T-7 (T-2)	C-22	C-16 (C-18)	(L-10) (L-6)	C-50	C-17	L-11	C-51

() Components used in a previous band

b. CRYSTAL CONTROLLED OSCILLATOR AND FIRST MIXER.

The high frequency mixer stage employs a 12AT7 (V-4) in a crystal controlled oscillator circuit to provide a heterodyning signal. In this oscillator circuit the crystal is connected between the cathodes of a dual triode. One section (V-4 pins 6, 7, 8) is a cathode follower amplifier, the other section, a grounded grid amplifier. Feedback voltage is coupled from the plate of one section, which contains a tank circuit resonant at the crystal frequency, to the grid of the other section. The crystal, inserted between the cathodes, acts as a filter. The phase change through the loop is zero and oscillation takes place at the crystal frequency. Crystal oscillator output voltage is coupled to the injection grid of the 6BA7 first mixer. An individual crystal for each band is switched into the crystal oscillator circuit except for 160 meters, where the high frequency oscillator is not used. The crystal oscillator beats with the incoming carrier to produce the first, or variable, intermediate frequency. In this stage, because the crystal frequency is fixed and the incoming carrier frequency may be anywhere in the range of the band in use, the difference frequency produced in the mixer must be tuned by a variable IF system.

c. VARIABLE IF. The variable IF covers the range 2.5 to 1.5 MC. The system consists of two slug-tuned coils on the same frequency. The first of these coils is capacity coupled to the second which in turn is connected to the grid of the second mixer V-5. L-23, a 5.7 MC trap is connected between the two coils to remove a spurious response that occurs at 3.533 MC.

d. VFO AND SECOND MIXER. A Type 70E-24 permeability-tuned precision variable frequency oscillator provides the injection voltage to the second mixer V-5. The frequency range of the VFO is 1955 KC to 2955 KC. This frequency is mixed with the variable IF in V-5 to produce the fixed 455 KC difference frequency which is the frequency of the fixed IF amplifier.

e. MECHANICAL FILTER. The functional diagram of the Collins Mechanical Filter is shown in figure 4-2. The mechanical filter uses the principle of magnetostriction to convert electrical energy to mechanical vibration. The magnetostriction transducer input coil is resonated at 455 KC. A nickel wire within this coil vibrates mechanically and transmits this mechanical energy to the first of a series of nickel alloy discs. The mechanical vibration of this first disc is coupled to succeeding

discs by means of nickel-wire coupling elements. Biasing magnets at either end of the mechanical filter polarize the filter elements to prevent frequency doubling, in much the same manner as biasing magnets in a headphone prevent the headphone diaphragm from bending in the same direction for both halves of an AC cycle. The mechanical vibration of the last disc is coupled to a magnetostriction transducer element identical to the one used at the input of the filter. By a reverse principle of magnetostriction, the mechanical vibration of the nickel-wire transducer core is converted to electrical energy.

Each of the discs employed in the mechanical filter has a mechanically resonant Q exceeding 2,000. Six of these discs are overcoupled to produce a mechanically-shaped response curve with a flat top and straight, almost vertical sides. Thus, the filter passes a band of frequencies very little wider than the flat top of the selectivity curve. The mechanical filter furnished with the 75A-4 passes a band of frequencies approximately 3 KC wide and centered on 455 KC, providing an IF selectivity curve ideal for the reception of AM and single-sideband signals. The 3-KC filter is supplied as part of the 75A-4; however, a mechanical filter having similar selectivity characteristics but having a band pass of 500 cycles is available for use in CW reception. A 6-KC filter is available for double-sideband reception of AM.

The mechanical filters used in the 75A-4 are the plug-in type that plug into a 9 pin miniature tube socket. These are sealed units and must not be tampered with. No external variable tuning is employed.

f. "Q" MULTIPLIER. (See figure 5-5.) The "Q" multiplier, as used in the 75A-4, is employed only as a rejection filter. In this capacity it performs the same function as the rejection notch of the crystal filter in earlier receivers but does it much better. It is capable of attenuating as much as 40 db, any single audio tone (heterodyne) which may be present within the receiver's passband. The "Q" multiplier consists of a cathode follower amplifier coupled to a regenerative amplifier, the plate load of which is a bridge T-filter. The regenerative amplifier is kept just below the oscillating point by R-36. At this point the plate circuit has a very high Q and provides a very sharp null to frequencies within the receiver passband. REJECTION TUNING capacitor C-72 can shift the null around to any frequency within the passband. The "Q" multiplier is removed from the circuit by turning the

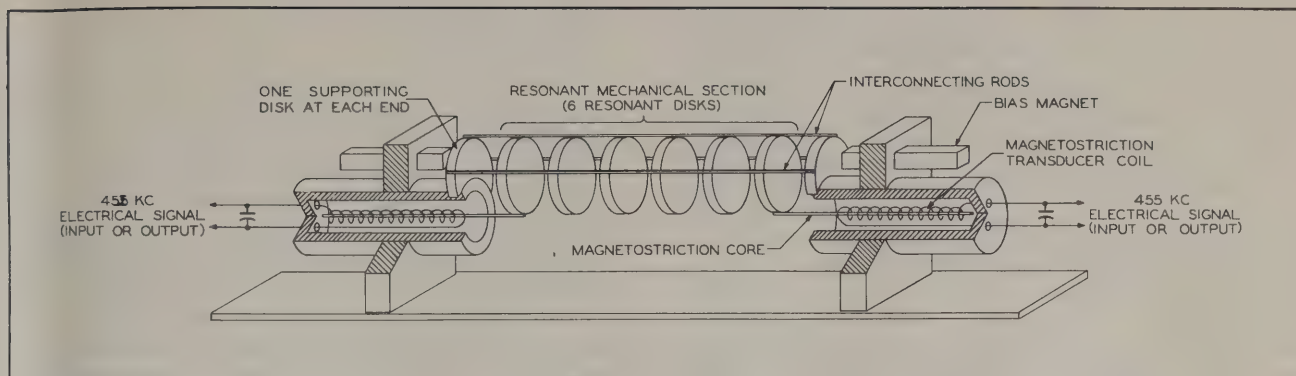


Figure 4-2. A Collins Mechanical Filter, Functional Diagram

REJECTION TUNING Control clockwise to actuate a switch which short circuits inductor L-26.

g. **455 KC IF. AMPLIFIER.** The 455 KC IF amplifier consists of V-6 which is associated with the mechanical filter and V-8 and V-9; the latter two are conventional IF amplifiers that contribute nothing to the passband wave shape, which is determined by the mechanical filter. All are 6BA6 tubes. AVC is applied to the grids of all three tubes.

h. **AM DETECTOR.** The AM detector is a conventional diode rectifier excited from IF transformer T-3 and having R-56 and R-57 as its load. The audio from the detector is applied to the noise limiter, V-12, when AM CW SSB selector switch S-3 is operated to AM position.

i. **CW-SSB DETECTOR.** This detector, V-11 is designed especially for SSB reception. It is a mixer type circuit that takes the output of the BFO and mixes it with the output of the 455 KC IF. Tube elements 1, 2 and 3 perform as a cathode follower amplifier. The remainder of the tube is a plate detector, the cathode of which is common with the cathode follower amplifier. The detector greatly reduces the distortion which is generated when a conventional diode detector is used for detecting SSSC signals. The audio from the detector is applied to the noise limiter V-12 when S-3 is operated to the CW-SSB position.

j. **BFO.** The BFO V-20, uses a 6BA6 in an electron coupled oscillator whose frequency range is approximately 453-457 KC. The BFO is tuned by means of the knob on the front panel labeled **PASSBAND TUNING**. The shaft of the **PASSBAND TUNING** Control is attached by a metal belt to the frame of the variable frequency oscillator which is mounted in a ball and oilite bearing equipped cradle. As the BFO is tuned through its range the VFO is also

tuned a like amount. (The shaft of the VFO is prevented from turning by the gearing of the vernier tuning dial.) Because the actual intermediate frequency is changing, the passband is being shifted and an unwanted signal can be dropped off the edge of the passband while retaining the wanted signal in the passband without changing its pitch.

4. AUDIO CIRCUITS.

a. **NOISE LIMITER.** Noise limiter V-12, a 6AL5 tube, couples the audio from the detectors to the first audio stage. The function of the noise limiter is to minimize interference by removing noise peaks which exceed the amplitude of the modulation. It is effective on AM, CW and SSB.

Both diode sections of the 6AL5 are required in order to limit both the positive and the negative peaks. During AM reception, a negative voltage is derived across diode load resistors R-56 and R-57. **NOISE LIMITER** Control R-67 is connected to this source of supply. As a result the cathodes of V-12 assume a negative DC potential which is adjustable by means of the **NOISE LIMITER** Control, and direct current flows through the diodes (the plates being positive with respect to the cathodes). The AF signal voltage from the receiver is applied to the anode (pin 7) of one section of V-12 through coupling capacitor C-93. This AF signal modulates the DC flowing through this diode section and, as a result, the AF signal appears across cathode resistor R-65. This resistor is common to both diode circuits, therefore the AF signal is superimposed on the DC flowing through the second section of V-12 and appears across load resistor R-63. From this point, the signal is coupled through C-96 and AF **GAIN** Control R-62 to the audio amplifiers.

Any negative impulse that drives the anode of the input diode (pin 7) more negative than the cathode, will cut off the diode, and that impulse will be

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limited to an amplitude equal to the threshold voltage (as set by the NOISE LIMITER Control). Similarly, any positive impulse that overcomes the threshold potential on the cathode of the second section (pin 5) will cut off that diode, and the positive impulse will be limited. As the NOISE LIMITER Control is turned toward 10 a less negative threshold voltage is applied to the diodes, and more severe limiting results. The threshold voltage at any given setting of the NOISE LIMITER Control varies with the average amplitude of the diode load signal, therefore limiting action automatically adjusts itself. C-97 and R-66 decouple the limiter circuit from the detector circuit.

During CW or SSB reception when the carrier is intermittent or absent, the reference voltage is supplied by connecting the NOISE LIMITER Control R-67 through switch S-3 to a value of bias obtained from the receiver bias rectifier. Because of the flat AVC characteristic of the receiver, frequent adjustment of the NOISE LIMITER Control is unnecessary.

The noise limiter is made inoperative by applying a value of B+ to the diode plates through R-64 and by grounding the cathodes of V-12 thus insuring that the diode currents cannot be cut off on noise or high modulation peaks. This is done by a switch associated with the NOISE LIMITER Control. C-98 provides a ground path for the audio when S-4 is in the OFF position.

b. AUDIO AMPLIFIERS. The audio section consists of two stages of voltage amplification (both halves of the dual triode V-13, a 12AT7) and a 6AQ5 power amplifier. The AF GAIN Control is located in the grid circuit of the first stage. Fixed bias from the bias rectifier is applied to the grid of the power amplifier. The output transformer secondary consists of a 500-ohm winding suitable for driving auxiliary apparatus and a four-ohm winding for use with loudspeaker voice coil and headphones. When a headphone is plugged into the headphone jack J-2, the speaker connection is interrupted and a 10-ohm load resistor is connected in parallel with the headphone to keep the output transformer properly loaded.

5. RF GAIN CONTROL SYSTEM.

The RF gain control system in the 75A-4 works in conjunction with the AVC system. To control the sensitivity of the set, a source of fixed bias is added to the AVC voltage which is then applied to the AVC controlled tubes. This system maintains the gain distribution constant throughout all settings of the gain control. In order to prevent the RF GAIN Control from affecting the characteristics of the line due to loading, an RF gain gate is employed to decouple the RF GAIN Control from the AVC line. This gate is in the form of 1/2 of a type 6AL5 twin diode, V19.

The other half of the tube is employed as a bias rectifier.

Bias from this rectifier is connected to one end of the RF GAIN Control. The arm of the control is connected to the AVC line through the RF gain gate, V19 (pins 1 and 7). Advancing the control adds negative bias to the AVC bias and reduces the gain of the tubes connected to the AVC line, namely, V-2, V-6, V-8, and V-9. The value of R104 is selected in final test and ranges from 180 ohms to 560 ohms. R104 in this set will be one of the following values and part numbers:

180 ohms	745 1321 00
220 ohms	745 1324 00
270 ohms	745 1328 00
330 ohms	745 1331 00
390 ohms	745 1335 00
470 ohms	745 1338 00

6. "S" METER.

The "S" meter is connected in a bridge circuit between the cathode of V-8 and the screen grids of V-6 and V-8. These are the I-F amplifier tubes that are furnished with AVC voltage. A reference voltage is developed at the positive terminal of the "S" meter by the screen current flow of V-6 and V-8. This reference voltage is adjusted by R-43 under no-signal conditions to a value equal to that developed at the negative terminal of the "S" meter by the cathode current of V-8. The presence of a signal in the IF strip causes an AVC voltage to be developed which reduces the current through V-8 causing its cathode voltage to decrease and at the same time causing the screen voltage on the two IF tubes to slightly increase. These changes of voltages at the cathode of V-8 and at the screen circuits of the two IF tubes, being in opposite directions, unbalance the bridge and cause the meter to read in proportion to the strength of the received signal. R41 adjusts the sensitivity of the "S" meter.

7. AVC SYSTEM.

A low impedance AVC line is employed to minimize blocking on strong signals. The RF amplifier V-2 and the 455 KC IF amplifiers V-6, V-8, and V-9 are all AVC controlled. A stage of IF amplification V-21, separate from the signal IF amplifier, is employed to amplify the IF signal for rectification for AVC voltage. The IF amplified IF voltage is rectified by 1/2 of V-16, a twin diode. The other half of V-16 is used as an AVC noise clipper. This tube clips sharp noise impulses from the AVC voltage and thus prevents the noise from desensitizing the AVC Circuit. A small positive DC voltage is applied to the AVC rectifier through R-86 to produce an AVC delay so that the AVC is ineffective on weak signals. A network of load resistors is switched by switch S-5 to select either fast or

slow AVC characteristics. C-110 provides RF filtering for the AVC detector output, R-89, R-91 and R-92 are the detector loads. R-90 and C-112 provide the AVC time constant with R-92 and R-91 modifying the time constant for slow and fast AVC operation. AVC test point J-4 is provided for use in aligning the AVC IF amplifier transformer T-4. Each controlled stage is decoupled from the AVC line by suitable capacitors and resistors to prevent instability because of RF feedback.

8. CALIBRATOR CIRCUIT.

The calibrator employs a 6BA6 tube in a crystal controlled oscillator circuit. The fundamental frequency of the oscillator is 100 KC, therefore, a harmonic appears at each 100 KC point over the entire range of the receiver when the calibrator is turned on. C-1 is used to zero beat a calibrator harmonic with a 1500 KC or 1600 KC broadcast station or with WWV at 2.5, 15 or 30 MC. The calibrator output is coupled to the receiver input by C-5. The calibrator is turned on wherever S-6 is in the CAL position.

SECTION V MAINTENANCE

1. TROUBLE SHOOTING.

The table of voltage measurements located at the end of the alignment procedure will help in locating troubles which might arise in the 75A-4. Most normal receiver troubles such as burned-out tubes,

loose connections, noisy volume controls etc., are easily discovered and remedied. However, should more obscure troubles arise, only a trained and competent repairman should be allowed to service the receiver. The following table gives a few possible causes for failure that might be associated with tubes having unusual functions.

TUBE	FUNCTION	SYMPTOM	CAUSE AND REMEDY
V-7	"Q" Mult.	Insufficient rejection notch. Notch not centered on dial when signal is centered in passband.	Realign L-26 and L-36 per part 6. Set panel control to midscale and adjust L-26 for notch.
V-10	MUTING DIODE	Insufficient muting.	Check muting voltage; should be +20 volts for 40 db muting.
V-11	SSB-CW DET	Hum level high.	Heater-cathode leakage in V-11 or V-20. Replace tube.
V-12	NOISE LIMITER	Excessive hum.	Heater cathode leakage in V-12. Try new tube.
V-21	AVC AMPLR	Insufficient AVC.	Bad tube or misalignment of T-4. Leaky AVC by-pass.
V-19	BIAS RECTIFIER	Excessive distortion.	Low bias voltage. Try new tube.

2. FUSE.

The 75A-4 is supplied with a 2 ampere fuse. If the fuse blows, do not replace it until the trouble has been determined and remedied. Use only a type 3AG Slo-Blo fuse of 2 ampere capacity.

3. TEST EQUIPMENT REQUIRED FOR 75A-4 ALIGNMENT.

- Signal generator.
- Vacuum tube voltmeter.

4. PRELIMINARY CHECKS.

- 2 ampere fuse in holder.
- Output voltage of power supply at approximately 170-V. (Measure at C-94B to ground.) Unless specifically changed in the following procedures, keep the following controls in the positions noted:

PASSBAND TUNING to 0

NOISE LIMITER to OFF

REJECTION TUNING to 0

SELECTIVITY to 3 KC FILTER

OFF-STANDBY-ON CAL to ON

5. 455 KC IF ALIGNMENT.

- a. Set the REJECTION TUNING Control to OFF, RF GAIN to maximum, the AM CW-SSB switch to AM, the AVC switch to FAST and the OFF-STANDBY-ON CAL switch to ON.
- b. Connect the lead from the signal generator to pin 1 of V-9, and tune the signal generator to 455 KC.
- c. Connect the VTVM to the AVC TEST POINT.
- d. Increase the signal generator level until an increase above the static level is noted on the VTVM.
- e. Adjust tuning cores of T-4 for a maximum indication on the VTVM.
- f. Connect VTVM to DIODE LOAD TEST POINT and set AVC switch to OFF.
- g. Adjust tuning cores of T-3 for a maximum indication on the VTVM.
- h. Connect signal generator to pin 1 of V-8.
- i. Adjust L-27 for maximum indication on VTVM.

6. REJECTION TUNING ALIGNMENT.

- a. Tune in 1800 kc calibration signal with KILOCYCLES dial to exact center of passband by watching "S" meter.
- *b. Adjust ANT TRIM until an "S" meter reading of exactly S9+40 is obtained.
- c. Turn R-36 to full counterclockwise position.
- d. Turn REJECTION TUNING Control (C-72) to center of passband.
- e. Adjust L-26 for minimum "S" meter reading
- f. Turn R-36 clockwise until an S meter reading of S-7 is obtained.
- g. Recheck steps d. and e., readjust where necessary.

If difficulty in the final adjustment of L-26 is encountered, the REJECTION TUNING Control may be moved slightly to compensate for small errors in L-26.

A rejection notch which is deeper than S-7 may be obtained with a higher setting of R-36. This is not advisable, however, because of the resulting instability such as hum modulation and a tendency for the "Q" multiplier circuit to lock to a strong interfering signal.

*If it is not possible to adjust to exactly S-9+40, use S-9+20 and set R-36 so "S" meter reads "O" at null.

The effect is quite similar to that obtained by operating a regenerative receiver too near to the edge of oscillation.

As R-36 is advanced even further clockwise, the "Q" multiplier circuit will oscillate. This causes the depth of the rejection notch to decrease sharply as R-36 is rotated through the point where oscillation begins.

7. BFO ALIGNMENT.

There are several conditions that might cause a need for resetting the BFO to frequency.

The first is where a slight drift of frequency produces a need for resetting the BFO to frequency.

The second is where the front panel has been removed and where the BFO knob (BANDPASS TUNING) has been removed from the shaft.

The third condition is where the BFO coil assembly has been replaced and a tracking problem exists.

a. SIMPLE ALIGNMENT. Where simple alignment of BFO frequency is concerned:

- (1) Turn REJECTION TUNING to OFF, set AM CW-SSB to AM. Select 3-KC filter. Select FAST AVC.
- (2) Set OFF-STANDBY-ON CAL switch to CAL.
- (3) Tune in a calibration signal with KILOCYCLES DIAL to exact center of passband by watching "S" meter.
- (4) Set PASSBAND TUNING to 0. Set AM-CW SSB to CW SSB.
- (5) Remove plug from top of BFO can and adjust inductance slug for zero beat.

b. Where the front panel or BANDPASS TUNING knob has been removed and the calibration of the BANDPASS TUNING knob has been lost:

- (1) If the tracking between the VFO and the BFO has not been disturbed, merely set the VFO frame so that the tubes are straight up, tune in a CAL signal to zero beat and put the BANDPASS TUNING knob on shaft with the marker on zero. Tighten the setscrews.
- (2) If the tracking between the VFO and BFO has been disturbed, (BFO shaft out of track at the flexible coupler or at the metal belt pulley) see the paragraphs below.

c. Where the BFO coil assembly has been replaced and complete tracking is necessary:

- (1) The new BFO coil is very nearly aligned when it is purchased i. e., the trimmer capacitor and coil slug are set to produce 455 KC at the correct position in the pitch control capacitor C-117 and a blue dot is painted at the root of the shaft of C-117 to use in initially positioning C-117.

Section V
MAINTENANCE

(2) After the BFO coil is properly connected, connect up the metal belt but allow the pulley to remain free on the BFO shaft.

(3) Set the VFO frame with the tubes straight up and tune in a CAL signal to dead center on the KILOCYCLES dial and set the DIAL SET to 0.

(4) Turn the AM CW-SSB Control to CW-SSB and turn the BFO shaft to zero beat with the blue dot upward.

(5) Set the PASSBAND knob to zero and tighten its setscrews.

(6) Tighten the setscrews in the pulley.

(7) Turn the PASSBAND TUNING Control through its range and see if the BFO tone stays at reasonably close to zero beat throughout the range. If an error of over 50 cps is experienced, the BFO can be retracked as follows:

NOTE

Because the following procedure is difficult do not attempt it unless the BFO tracking error is really objectionable.

(9) Use 6 KC filter, setup for CW operation, tune PASSBAND TUNING to 0 and tune in a CAL signal to zero beat with KILOCYCLES dial on the 160-meter band.

(10) Peer down in the BFO can and note the positions of the two trimmer adjustment slots. Make a drawing if necessary.

(11) Turn the inductance trimmer (L-31) 10 degrees or so clockwise.

(12) Return to zero beat by turning the trimmer capacitor C-118.

(13) Now offset the KILOCYCLES dial on the low frequency side of 0 until a very low frequency tone is produced.

(14) Tune the PASSBAND TUNING Control through its range and see if the tone error is any better. (The change will be only in the order of a few cps so frequency measuring equipment should be used if available.)

(15) If the results are favorable return the KILOCYCLE dial to zero beat and repeat steps 11 through 14.

(16) If the error is greater, return the trimmers (L-31 and C-118) to their original positions and repeat steps 12 through 14 except turn the inductance trimmer L-31 in the other, or counterclockwise, direction.

(17) Repeat the alignment procedure until no better results can be obtained. The error should now be less than 50 cps.

NOTE

An error produced by backlash is possible. This error must not be included when checking for alignment, therefore when the end stops of the PASSBAND TUNING knob are reached, back up the knob very slightly to take up the backlash.

NOTE

It should be possible to swing the BAND-PASS TUNING knob 2.5 KC each side of center without being stopped either by the VFO frame hitting the chassis or by the BFO shaft end stops. If either of these occur, reset the BFO end stops and BAND-PASS TUNING knob as required and reset the BFO frequency to zero beat with L-31.

8. VARIABLE IF AND 160-METER BAND ALIGNMENT.

a. Connect signal generator to antenna input through a 100-ohm dummy antenna, and connect VTVM to DIODE LOAD test point.

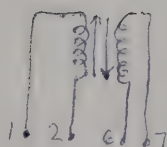
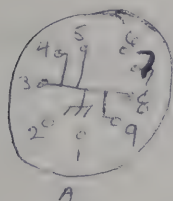
b. Connect audio output meter to audio terminals 500 and G and rear of receiver.

c. Set AM CW-SSB switch to AM, AUDIO GAIN to maximum, and RF GAIN to maximum. Select 3 KC mechanical filter.

d. Set receiver dial and signal generator to 1.6 MC, and adjust tuning slugs L-18, L-22, and T-1 for maximum output indication.

e. Set receiver dial and signal generator to 2.4 MC, and adjust capacitor C-7, C-53, and C-56 for maximum output.

75A4



SKETCH AT (A) IS EXISTING WIRING AT FILTER
 SOCKET XFL IN A COLLINS 75A4 RECEIVER.
 BROADBAND I-F TRANSFORMER (B) MAY BE PLUGGED
 DIRECTLY INTO THE FILTER SOCKET.

NOQOU 1306118 1903402
 00415 1306128 1903402

1001E 0000F-NE103 2 NOXBN

SENT

SR C

HIG

22312 11/11/72

PRICE																			
PARTS DESCRIPTION																			

NQSRC

-T-R-190302Z MAY 72

-FM NSRL

-TO DQGL

BT
UNCLAS

1. REF MY 240304Z APR 72
2. NO ANSWER RECEIVED

f. Repeat steps d. and e. until no further increase is noted in output.

9. ALIGNMENT OF CRYSTAL OSCILLATOR.

a. Connect VTVM through a 1 megohm resistor to pin 2 of V-3. Turn AM CW-SSB to AM.

b. Set BAND switch to 80 and adjust L-12 for maximum output indication.

c. Successively change BAND switch to 40, 20, 15, 11, 10, 10 and adjust L-13, L-14, L-15, L-16, L-17, and L-11 in that order for a maximum output indication. Adjust L-13 core one-quarter turn into coil from peaked position.

d. The frequency of the crystals may be adjusted over a limited range by the adjustments of steps b. and c. After other alignment operations are completed, this method may be used to reduce the calibration error between bands.

e. Turn on the CAL oscillator (100 KC crystal standard) being sure it is on frequency. (See part 5 of section II for adjustment), and tune the receiver to zero beat at exactly 2.0 MC.

NOTE

Do not turn tuning dial or PASSBAND TUNING during the remainder of this adjustment.

f. Turn BAND switch successively to the remaining bands, and adjust the receiver to zero beat by repeating steps b. and c. Be sure that the crystal oscillator does not stop oscillating or does not start oscillating at a spurious frequency.

10. RF ALIGNMENT.

a. Connect signal generator to antenna terminals on receiver, and VTVM to DIODE LOAD test point.

b. Rotate BAND switch to 160, and tune signal generator and receiver to 1.6 MC.

c. Adjust tuning core in T-1 for maximum diode load voltage.

NOTE

ANT TRIM shall be set to half capacity while aligning all bands.

d. Tune the signal generator and receiver to 2.4 MC, and adjust capacitor C-7 for maximum diode load voltage.

e. Repeat steps c. and d. until no further increase in output is noted. If the 160-meter coil was aligned along with the 1.5 to 2.5 MC IF, disregard the above and proceed with the remainder of the bands.

f. Repeat steps c., d., and e. for the other bands using the following table as a guide.

BAND	RECEIVER AND SIG. GEN. FREQ. LOW END	RF "L"	ANT "L"	RECEIVER AND SIG. GEN. FREQ. HIGH END	RF "C"	ANT "C"
160	1.6	-	T-1	2.4	-	C-7
80	3.3	L-6	T-2	4.1	C-23	C-8
40	6.9	L-7	L-1	7.7	C-26	C-11
20	14.1	L-8	L-2	14.9	C-28	C-13
15	20.6	L-9	L-3	21.4	C-30	C-15
*11	27.1	-	-		C-31	-
*10	28.1	L-10	T-7	28.9	C-32	C-16
*10	29.5				C-17	

*In performing the alignment of the 11 and the two 10-meter bands, a specific sequence is necessary. First, align the 28 to 29 MC band in the normal manner with the ANT TRIM at midscale. The 26.5 to 27.5 MC band and the 29 to 30 MC bands are aligned at one point only by RF trimmers, C-31 and C-17. It is necessary to retune the ANT TRIM for resonance on these bands since no alignment trimmers are provided in the antenna circuit. Any retuning of L-10 after alignment will affect the tracking of bands 11, 10 and 10.

11. VFO ADJUSTMENT.

The VFO is calibrated at the factory and should require adjustment at only widely separated intervals. If the calibration error becomes excessive for operation or beyond the point where the vernier dial corrector (ZERO SET Control) can correct, the following procedure should be followed to make correcting adjustments:

- a. Use the 100 KC/s calibrator. Allow the receiver to warm up from 1 to 2 hours.
- b. Set the BAND CHANGE switch to the 160-meter band. Tune KILOCYCLES dial to 1.5 MC/s. Set up in accordance with paragraph 9 of OPERATION section to zero beat with calibrator signal. Note the dial reading if fiducial line cannot be set to 0.
- c. Rotate KILOCYCLES dial to 2.5 MC/s and exactly tune until zero beat is obtained. Do not re-adjust BFO or ZERO SET Control. The calibration error is then the number of dial divisions more or less than the 10 turns it should take to cover the range. Usually, the error tends to be toward more rotation of the KILOCYCLES dial than the 10 turns that should be required. To correct this error, proceed as follows:

- (1) Rotate the KILOCYCLES dial towards and through dial zero until a total of 1.8 times the dial division error has been counted. Engage the trimmer adjusting stud with a strong thin wire and turn until zero beat is restored. The ZERO SET adjustment can now be rotated so that the ZERO SET is set to dial zero.

- (2) To check the accuracy of the adjustment retune the KILOCYCLES dial to 1.5 MC/s and check the calibration error. If the adjustments have been done carefully less than 1/2 division dial error will be found. The above procedure can be repeated until satisfactory results are obtained. This endpoint adjustment restores factory accuracy to the intermediate points, also.

- (3) If it is desired to recenter the dial vernier pointer the following additional procedure should be followed. Set the ZERO SET Control to midscale, loosen the two setscrews of the VFO dial-shaft coupler and carefully turn the oscillator shaft until zero beat is obtained. During the VFO adjustment, best results in frequency readings will be obtained if the AVC is OFF and the RF GAIN Control is used at a low value.

12. TWEET TRAP ADJUSTMENT.

- a. A third order tweet appears at 3.533 MC in the 80-meter band caused by the 5.7 crystal beating with the second harmonic of the VFO at the mixer V-5.
- b. Turn the AM CW-SSB switch to CW-SSB and tune in the tweet.
- c. Adjust the core of L-23 until the level of tweet is minimum.

13. AVC THRESHOLD (R-9).

- a. Connect VTVM to AVC test point and ground and set range switch to 5-volt range.
- b. Set RF GAIN to maximum. Select FAST AVC.
- c. Feed a 29.5 MC signal from a signal generator into the antenna terminals using a 100-ohm resistor in series with the signal generator.
- d. Tune in the signal "on the nose".
- e. Increase the input signal until a definite increase in AVC voltage is noted and record the input.
- f. Adjust R-9 so that the AVC threshold occurs with 3 uv input.

14. DIAL CORDS.

The front panel must be removed for replacement of the dial pointer cord or the drum rotator cord. Figure 5-1 shows both cords in place and the direction in which the restringing should proceed.

- a. REMOVING FRONT PANEL. (See figure 5-4).

- (1) Remove the six panel screws.

- (2) Remove the following knobs:

REJECTION TUNING

SELECTIVITY

PASSBAND TUNING (see CAUTION below)

ANT TRIM

BAND CHANGE

KILOCYCLES TUNING

CAUTION

Set the PASSBAND TUNING Control knob on the index mark (straight up) and do not move the control after the knob has been removed. If the control has been accidentally moved, see part 7 for instructions for adjusting the knob position.

b. POINTER CORD. Obtain a type 432 1018 00 Collins Dial Cord.

(1) Scribe a mark on the VFO shaft and the KILOCYCLES dial hub to mark their relative positions and remove the KILOCYCLES dial.

(2) Turn the tuning knob to the clockwise stop.

(3) Start at point X in the drawing with the cord hooked to one end of the spring (part number of spring is 503 1240 001).

(4) Bring cord around pulley C to pulley B.

(5) Wrap around pulley B clockwise, through the deep slot, around the tab, and back through the shallow slot. Wrap around pulley B two times clockwise.

(6) Wrap cord around pulley A and loop the end on the free end of the spring.

(7) Fasten the pointer to the cord, tune in a station of known frequency and adjust the pointer to the correct setting.

(8) Replace the KILOCYCLES tuning dial. Match up the scribe marks (see step (1) and tighten setscrews.

(9) Replace the panel.

c. DRUM CORD. Obtain a 432 1020 00 Collins Dial Cord.

(1) Turn the band switch to the 1.5 - 2.5 MC band (pulley D at counterclockwise stop).

(2) Turn pulley E approximately one turn and hold the tension spring taut.

(3) Make approximately 3/4 turn around pulley D and hook cord to tab.

(4) Extend the cord around pulley E and hook to the tab. Release the tension spring.

(5) Replace the panel.

(6) Loosen the setscrew in the drum hub opposite the coil tension spring, and align the dial calibration to the 1.5 - 2.5 MC band. Then tighten the setscrew.

TABLE 5-1. VOLTAGE AND RESISTANCE MEASUREMENTS

Pin Number											
TUBE		1	2	3	4	5	6	7	8	9	PLATE CAP
V-1	DC V.	-22.5	7.5			88	64	8			
	AC V.			0	6.3						
	Ohms	680K	4700	0		00	140K	4700			
V-2	DC V.	-5.7	0			190	175	0			
	AC V.	1		0	6.3	165					
	Ohms	1.5 meg	0	0		20K	50K	0			
V-3	DC V.	140	-2.7	2.3			0	0	0	190	
	AC V.	55			6.3	0					
	Ohms	22K	25K	120		0	0	510K	0	21K	
V-4	DC V.	175	0	1.5			175	-2.6	1.8		
	AC V.				0	0				6.3	
	Ohms	21K	0	330	0	0	21K	10.5K	330		
V-5	DC V.	105	-3.8	1			0	0	0	190	
	AC V.				6.3	0					
	Ohms	27K	100K	68		0	0	0	0	21K	

Section V
MAINTENANCE

TABLE 5-1. VOLTAGE, AND RESISTANCE MEASUREMENTS (Cont.)

Pin Number											
TUBE		1	2	3	4	5	6	7	8	9	PLATE CAP
V-6	DC V. AC V. Ohms	-2.8 1.8 meg	0 0	0 0	6.3	190 20K	100 35K	*4 *2.6K			
V-7	DC V. AC V. Ohms	185 21K	0 100K	2.3 470	0 0	0 0	185 20K	0 330K	2.3 470	6.3	
V-8	DC V. AC V. Ohms	-5.7 1.4 meg	0 0	0 0	6.3	~~185~~ 190 22K	95 36K	0.65 220			
V-9	DC V. AC V. Ohms	-.7 420K	0 0	0 0	6.3	185 22K	85 68K	1.2 150			
V-10	DC V. AC V. Ohms	1.4 3.3K	0 70K	0 0	6.3	.85 00	0 00	0 00			
V-11	DC V. AC V. Ohms	140 33K	0 100K	3.6 820	0 0	0 0	84 75K	0 100K	3.6 820	0 6.3	
V-12	DC V. AC V. Ohms	*** -13.5 400K	*** -13.5 470K	0 0	4.3 2.7	*** -13.5 ** 400K	0 00	*** -13.2 250K			
V-13	DC V. AC V. Ohms	69 240K	0 68K	1.5 3.3K	0 0	0 0	75 240K	0 510K	1.4 3.3K	0 6.3	
V-14	DC V. AC V. Ohms										
V-15	DC V. AC V. Ohms										
V-16	DC V. AC V. Ohms	0.1 340K	0.1 340K	0 0	6.3	15 3.3K	0 00	-.5 2.2 meg			
V-17	DC V. AC V. Ohms	00	22K	00	68	00	72	00	22K		

TABLE 5-1. VOLTAGE, AND RESISTANCE MEASUREMENTS (Cont.)

		Pin Number									PLATE CAP
TUBE		1	2	3	4	5	6	7	8	9	
V-18	DC V.	0	0	0	0	160	0	0			
	AC V.										
	Ohms	00	0	00	00	23K	00	00			
V-19	DC V.		-135				0				
	AC V.			0	6.3	120AC					
	Ohms		30K	0		0	00				
V-20	DC V.	-5	0		0	14	42.5	0			
	AC V.			6.3	0						
	Ohms	150K	0		0	10K	00	0			
V-21	DC V.	0	0			185	75	1.3			
	AC V.			0	6.3						
	Ohms	1 meg	0	0		22K	82K	150			
V-22	DC V.	-11	0			220	205	-11			
	AC V.			0	6.3						
	Ohms	168K	0	0		21K	20K	168K			

NOTES:

1. AVC in OFF position.
2. Unless otherwise indicated RF GAIN adjusted until "S" meter needle rests at S-9 with no signal input.

* Depends upon setting of R-9.

** Depends upon setting of R-67.

*** AM CW-SSB at CW-SSB; NOISE LIMITER (R-67) at 1.

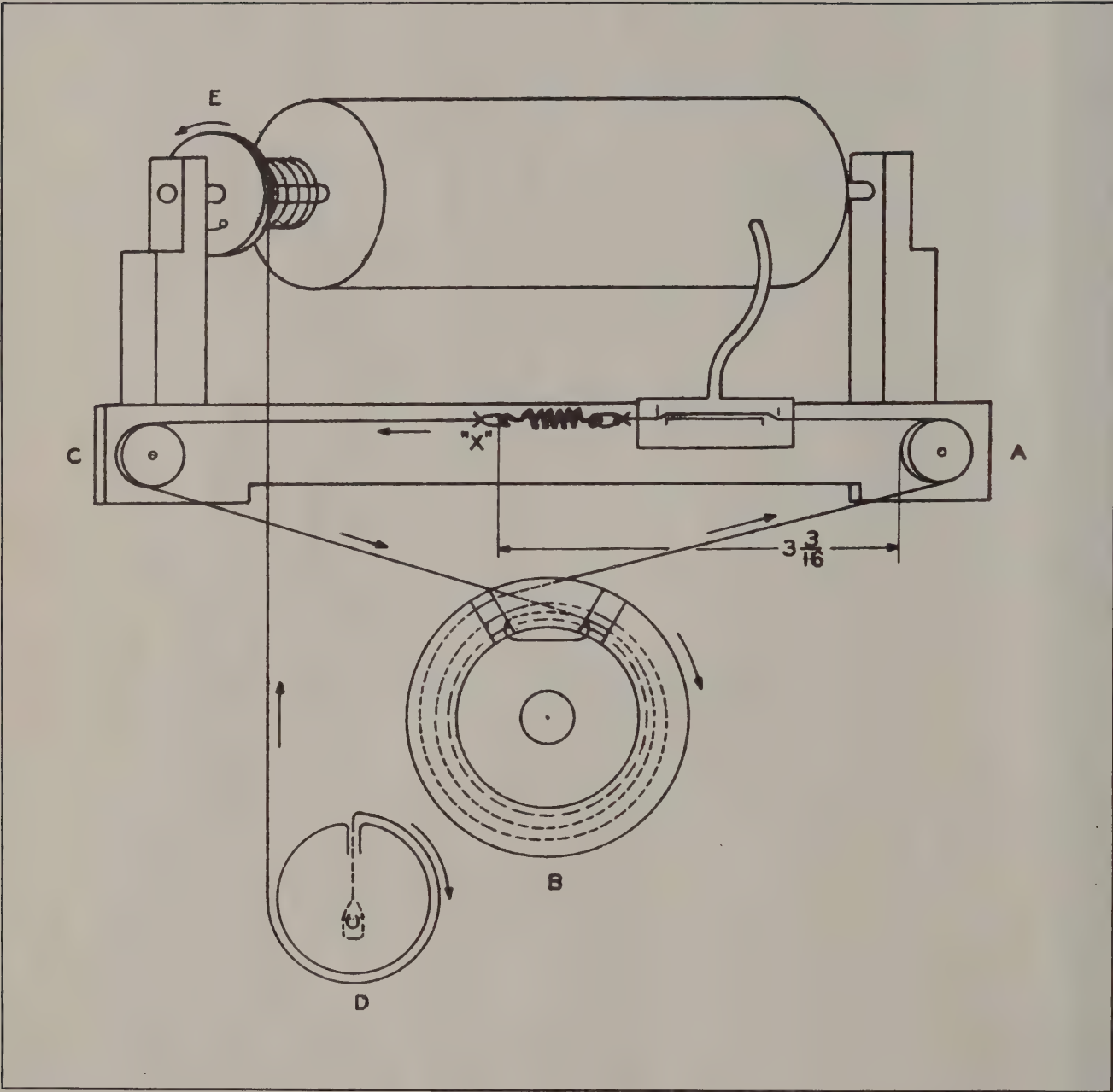


Figure 5-1. Dial Cord Replacement

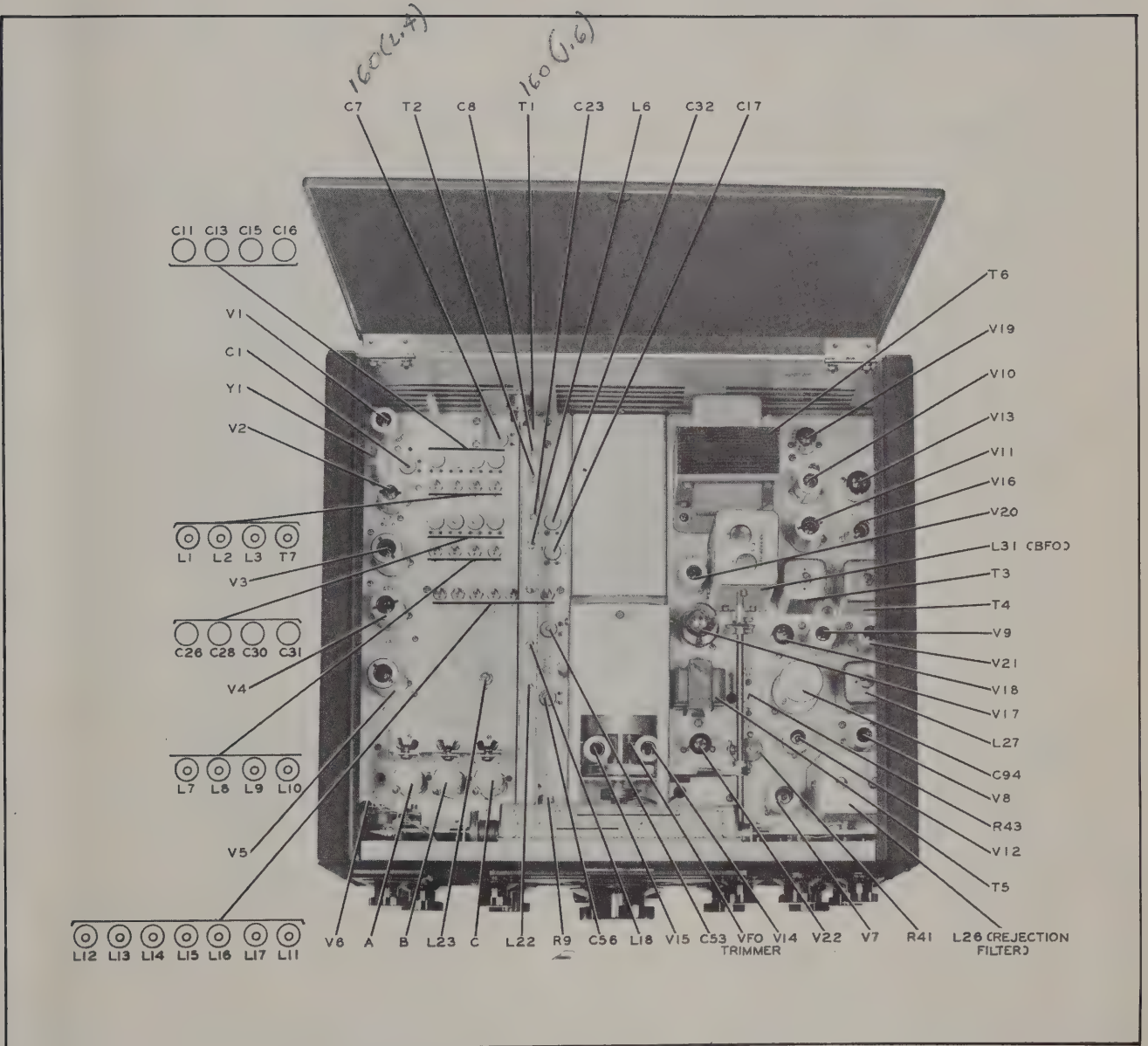


Figure 5-2. 75A-4, Top View

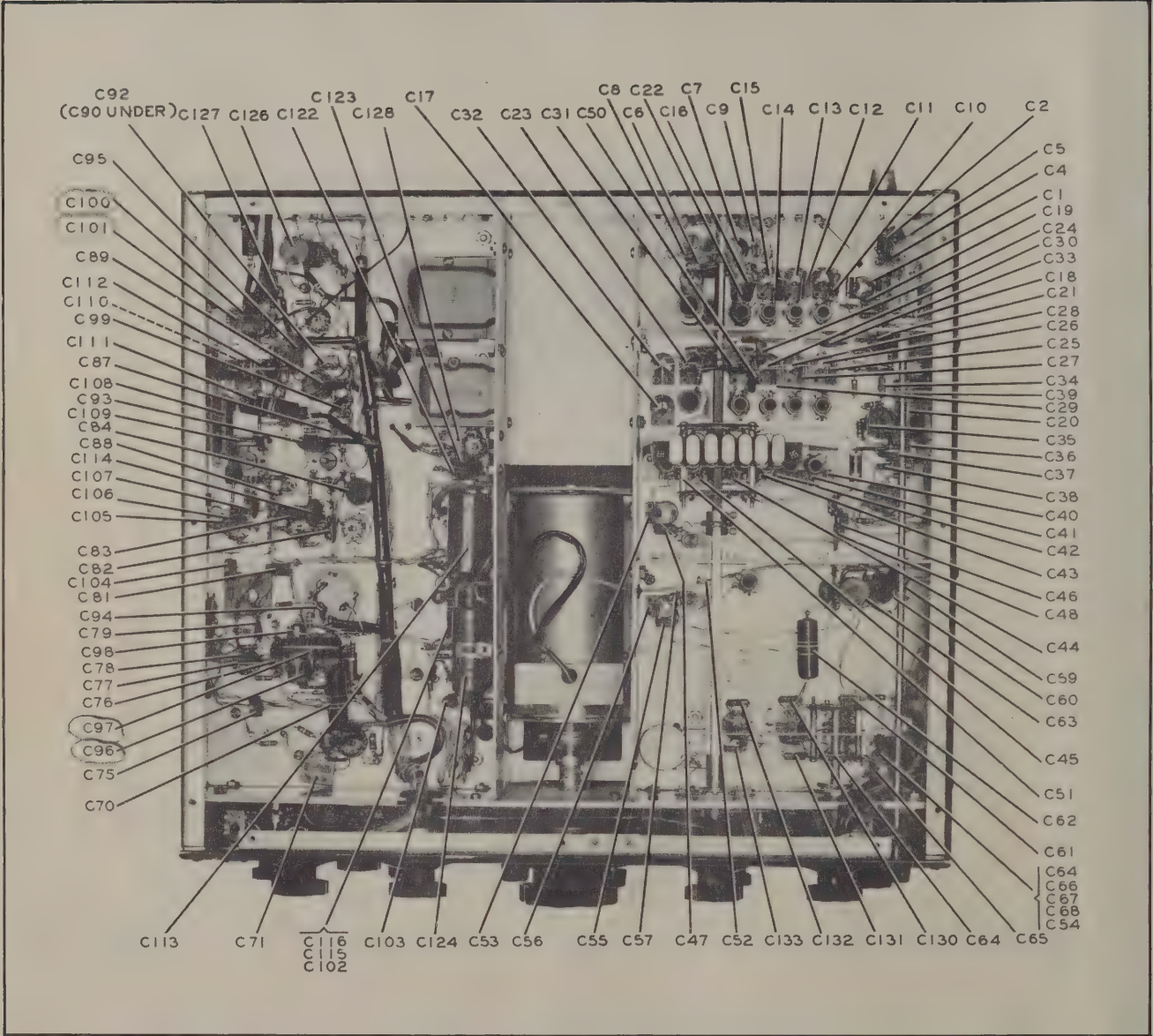


Figure 5-3. 75A-4, Bottom View, Page 1

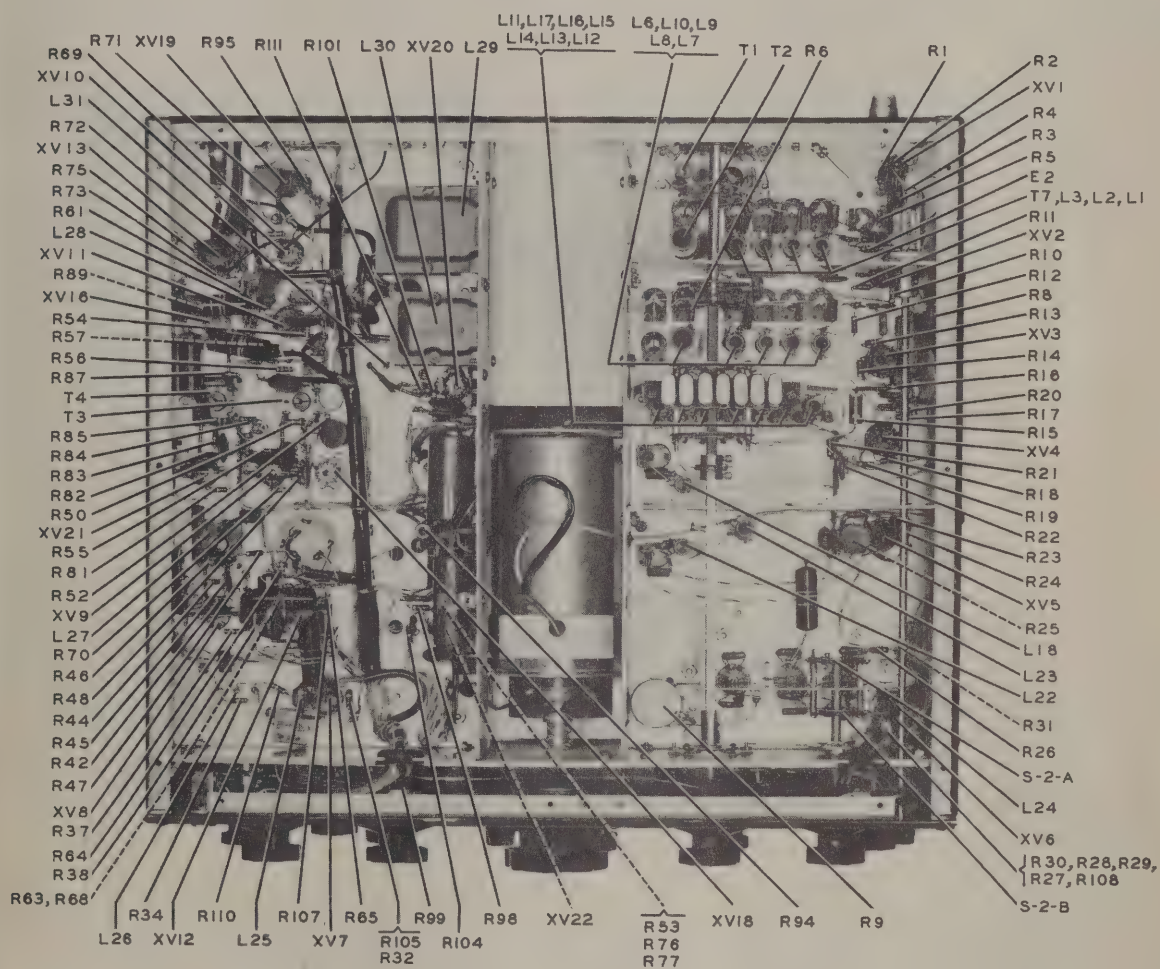


Figure 5-3. 75A-4, Bottom View, Page 2

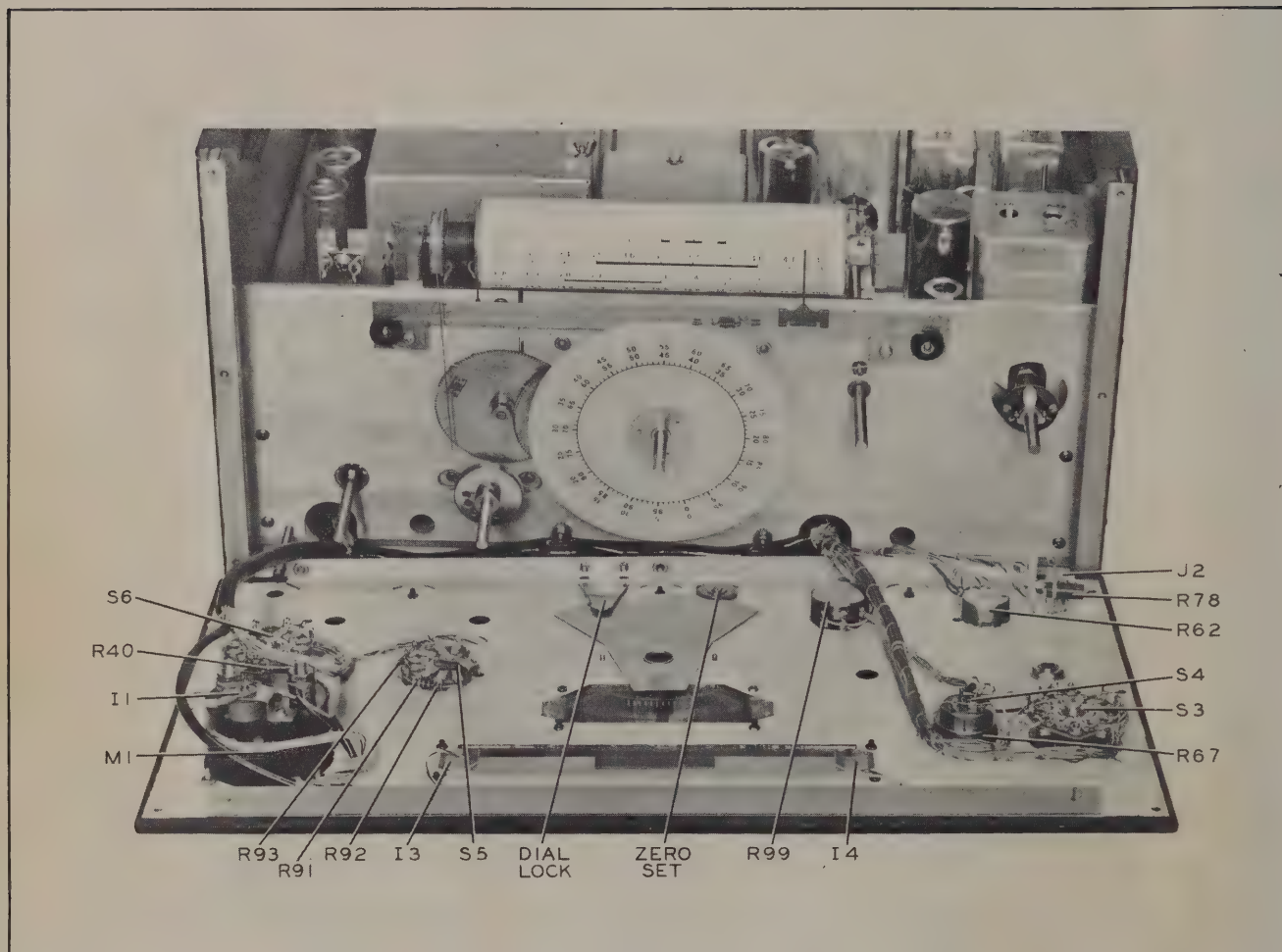
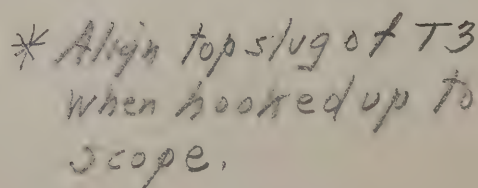


Figure 5-4. 75A-4, Front Panel Lowered



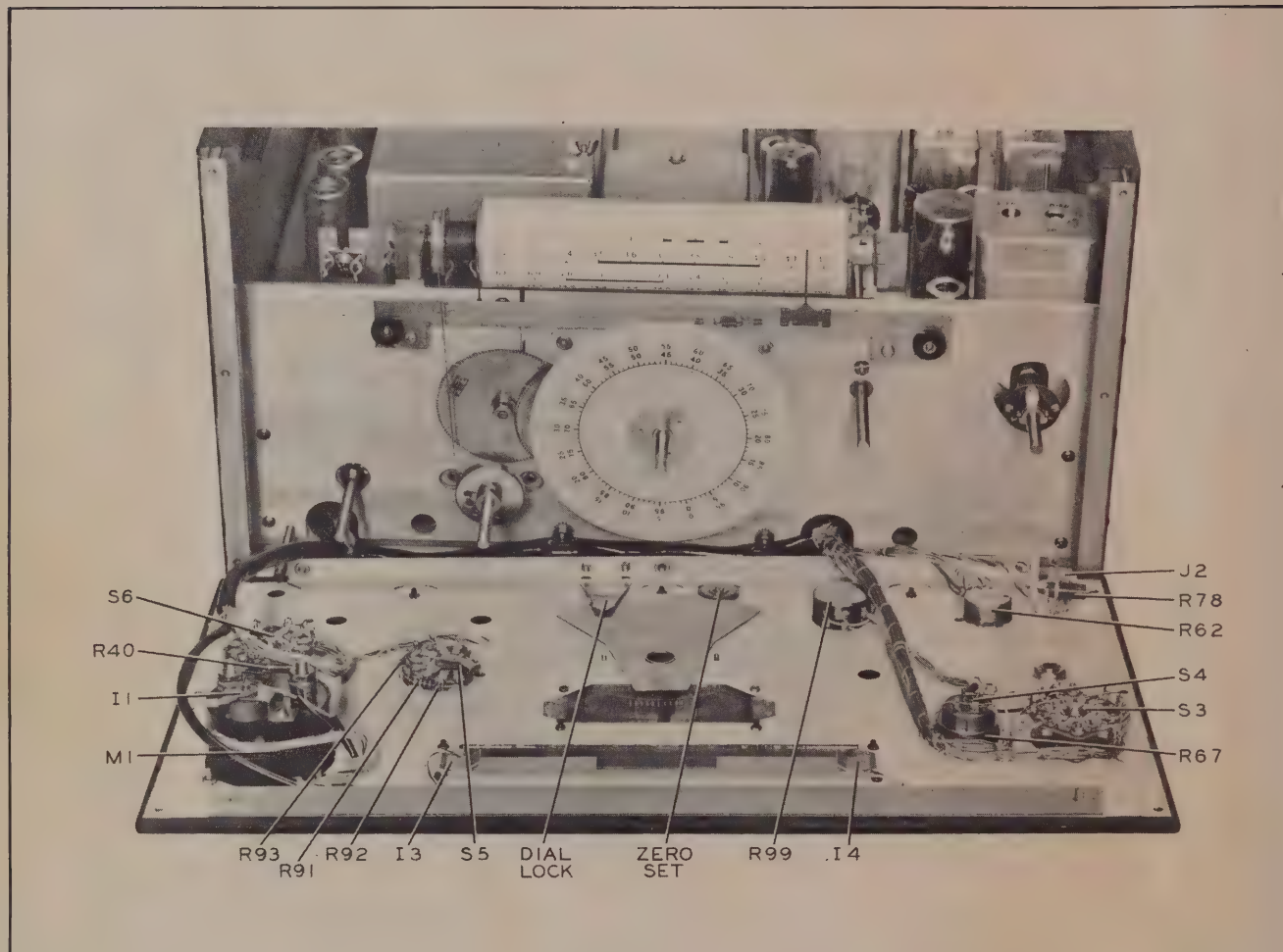
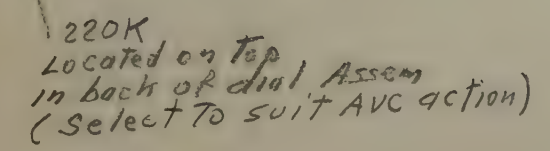
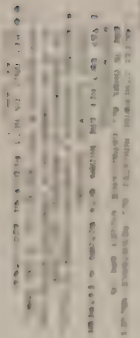


Figure 5-4. 75A-4, Front Panel Lowered



5-13/14

一一一



230K
located on top
in h.o. of div 1. A.C. on
(see also 70 sec. + A.V. action)

Figure 5-5 TSA-4 Receiver, Schematic Diagram



PIN

1 2 3 4 5 6 7 8 9

V18

160
148

V19

-135
-120

120AC
99AC

V20

-5
-55

14 42.5

V21

17.5 33.5
185 75 1.3
158 65 1.2

V6

-2.8
0

190 100
163 4

V7

185 2.3
172 1

185 2.3
175 1

V8

-5.7
-0.2

190 950.65
172 85 0.6

V9

-0.7
-0.01

185 85 1.2
165 75 1.1

V10

1.4
1.35

85
0

V11

140
115

84 3.6
75 3.7

V12

-13.5 -13.5
-13.5 -12.5

-135 -13.2
-13.2 -12.2

V13

69
53

75 1.4
57 1.4

V14

0.1 0.1
+

15 -1.5
16 -

V22

-11
-10

220 205 -11
200 175 -10

OC

1 2 3 4 5 6 7 8 9

V1
-32.5 7.5
-28 6.2

V2

-5.7
-1.2

190 175
160 165

V3

140 -2.7 2.3
115 0 2.2

V4

175 1.5
150 1.4

175 2.6 1.8
150 0 2.1

V5

105 -3.8 1
82 -1.7 1

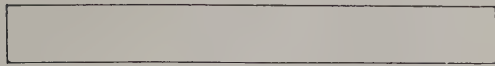
190
170

R-11 500-2-2

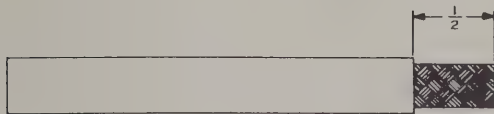
750 2001 00

MARINE CORPS NAVMARCORDMARS RADSTA

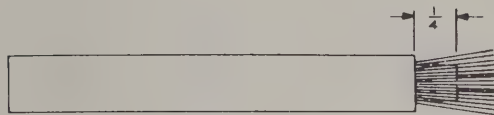
NØMAL	ALBANY, GA
NØMBA	BARSTOW, CA
NØMBU	BEUFORT, SC
NØMCL	CAMP LAJEUNE, NC
NØMCP	CHERRY POINT, NC
NØMET	EL TORO CA
NØMGB	GUANTANAMO, CUBA
NØMH	ARLINGTON, VA
NØMHK	KANEOHI, HI
NØMHS	CAMP SMITH, HI
NØMJI	EIAKINI, JAPAN ?
NØMOB	CAMP SCHWAB, OKINAWA
NØMOD	CAMP HAUGE, OKINAWA
NØMOF	CAMP FOSTER, OKINAWA
NØMOH	CAMP HANSOL, OKINAWA
NØMOI	CAMP MCTUREOUS, OKINAWA
NØMOP	CAMP COURTNEY, OKINAWA
NØMOQ	FUTEMA, OKINAWA
NØMPN	CAMP PENDLETON, CA
NØMPR	CAMP GARCIA, PR
NØMQU	QUANTICO, VA
NØMSD	SAN DIEGO, CA
NØMTP	29 PALMS, CA
NØMYU	YUMA, AZ



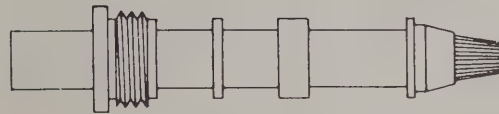
CUT END OF CABLE EVEN.



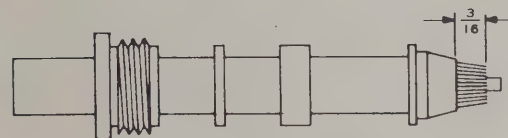
REMOVE VINYL JACKET $\frac{1}{2}$ INCH —
DON'T NICK BRAID.



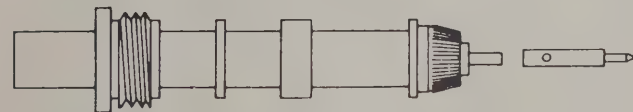
COMB OUT COPPER BRAID AS SHOWN.
BARE $\frac{1}{4}$ INCH OF CENTER CONDUCTOR—
DON'T NICK CONDUCTOR.



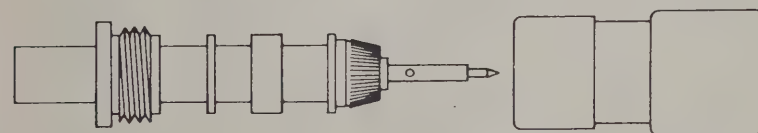
TAPER BRAID AS SHOWN. SLIDE NUT,
WASHER AND GASKET ON VINYL JACKET.
SLIDE CLAMP ON BRAID.



WITH CLAMP IN PLACE, TRIM BRAID
AS SHOWN.

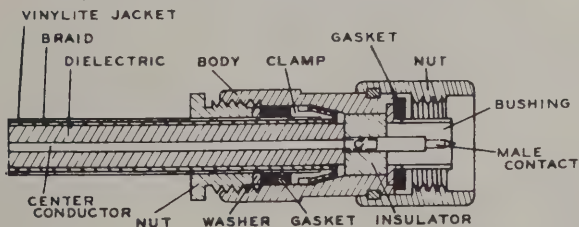


FOLD COPPER BRAID BACK ON CLAMP.
TIN CENTER CONDUCTOR,
USING MINIMUM AMOUNT OF
HEAT.



HOLDING CONTACT WITH PLIERS,
SOFT SOLDER CONTACT TO
CENTER CONDUCTOR. IT IS
IMPERATIVE THAT BACK END
OF CONTACT BE FLUSH WITH
POLYETHYLENE DIELECTRIC. DO
NOT USE EXCESS SOLDER. WIPE
CLEAN—SEE THAT END OF
CABLE INSULATOR IS CLEAN
AND FREE OF SOLDER, ROSIN
AND FOREIGN MATERIAL.

PLUG 357 9040 00 (UG-21B/U)



SLIDE BODY INTO PLACE CAREFULLY SO
THAT CENTER CONDUCTOR ENTERS HOLE
IN INSULATOR. FACE OF CABLE DIE-
LECTRIC MUST FIT FLUSH AGAINST IN-
SULATOR. PROPERLY TIGHTEN BODY
AND NUT WITH WRENCHES.

Figure 5-6. Assembling Plug UG-21B/U to Cable RG-8/U

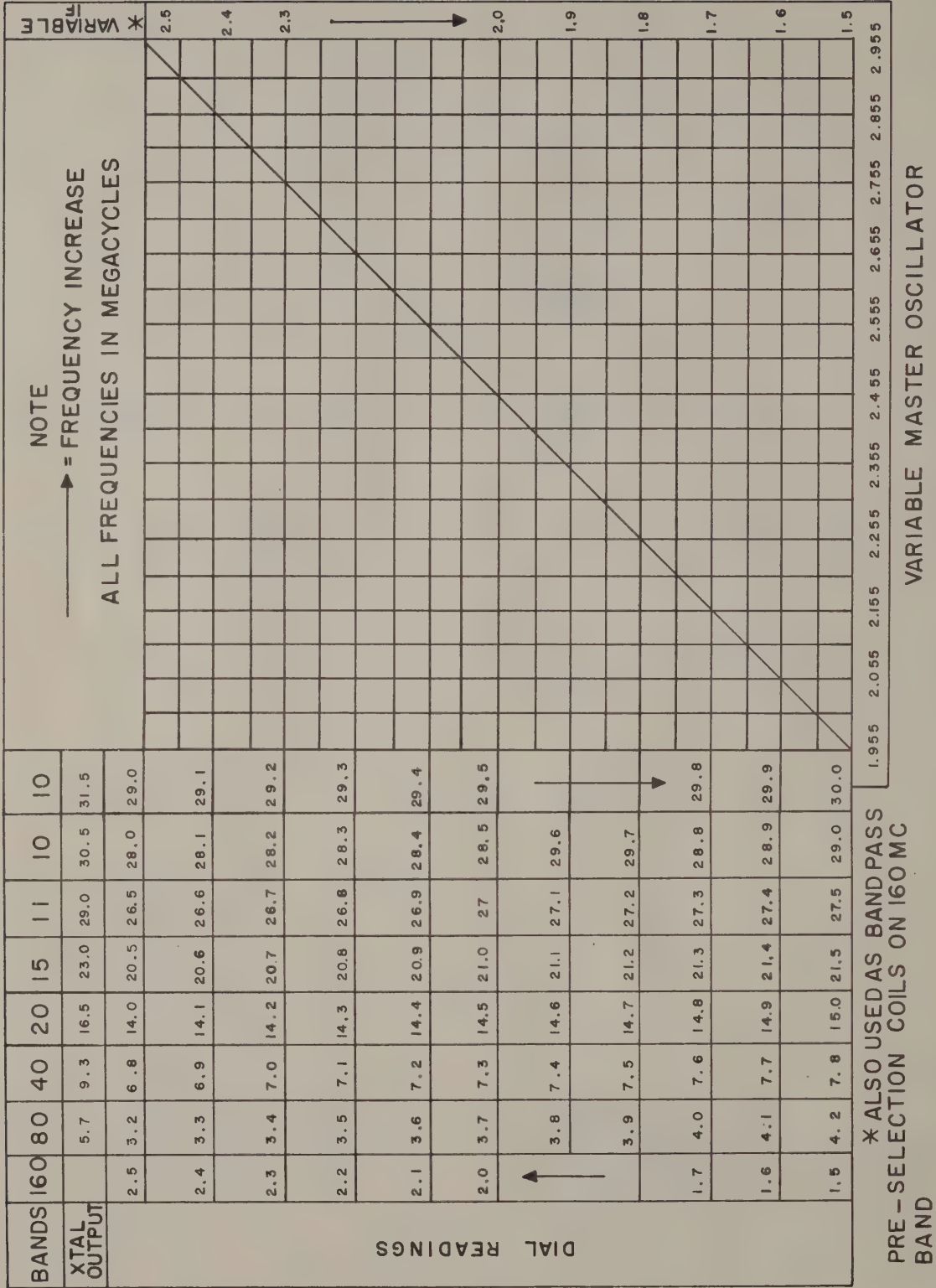
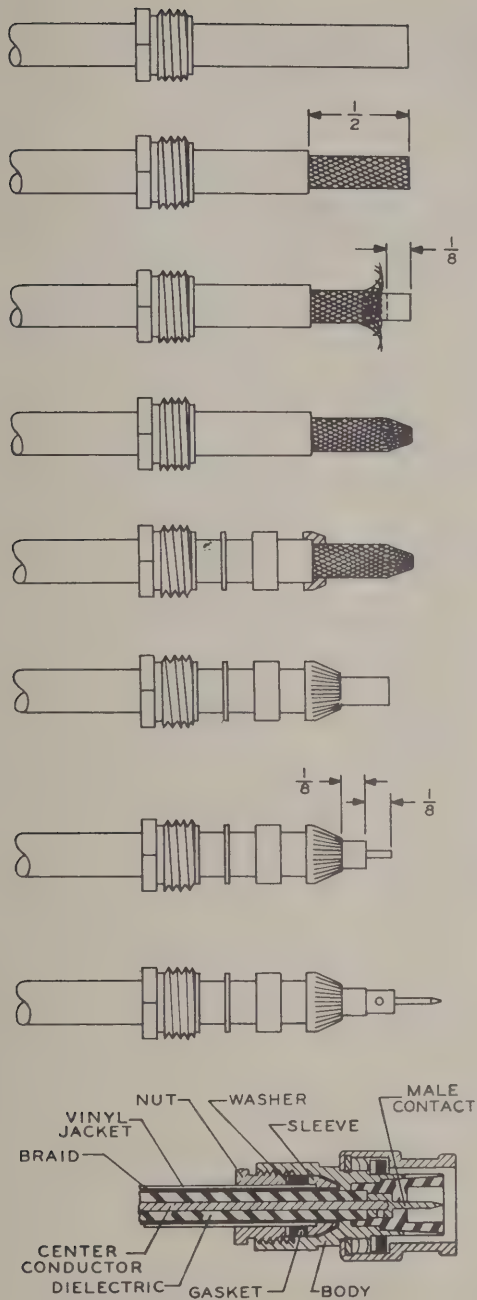


Figure 5-7. Dial Divisions Table



SLIDE NUT ONTO CABLE.
CUT END OF CABLE EVEN.

REMOVE VINYL JACKET FOR 1/2 INCH.
DO NOT NICK BRAID.

PUSH BRAID BACK AND REMOVE 1/8 INCH OF
DIELECTRIC AND CENTER CONDUCTOR

TAPER BRAID.

SLIDE WASHER, GASKET AND SLEEVE OVER TAPERED
BRAID. FIT INNER SHOULDER OF SLEEVE SQUARELY
AGAINST END OF JACKET.

COMB OUT BRAID, FOLD BACK SMOOTH AS SHOWN
AND TRIM 3/32 INCH.

BARE CENTER CONDUCTOR 1/8 INCH.
DO NOT NICK CONDUCTOR.

TIN CENTER CONDUCTOR. SLIP MALE CONTACT IN
PLACE AND SOLDER. REMOVE EXCESS SOLDER. BE
SURE THAT CABLE DIELECTRIC IS NOT HEATED EX-
CESSIVELY AND SWOLLEN SO AS TO PREVENT DI-
ELECTRIC FROM ENTERING BODY.

PUSH INTO BODY AS FAR AS IT WILL GO. SLIDE
GASKET, WASHER AND NUT INTO BODY. SCREW INTO
PLACE, WITH WRENCH, UNTIL MODERATELY TIGHT.
HOLD CABLE AND BODY RIGIDLY AND ROTATE NUT.

Figure 5-8. Assembling Plug UG-260/U to Cable UG-58/U

NOTES

SECTION VI PARTS LIST FOR 75A-4 RECEIVER

TABLE 6-1

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C-1	Calibration Oscillator frequency adjuster	CAPACITOR, variable: ceramic; 5-25 mmf; 350 wv	917 1073 00
C-2	V-1 Cathode bypass	CAPACITOR: ceramic; .01 mf, +100 -20%; 500 wv	913 3013 00
C-3	V-1 Screen bypass	CAPACITOR: mica; 200 mmf, $\pm 10\%$, 500 wv	912 0519 00
C-4	V-1 plate decoupling	CAPACITOR: ceramic; .01 mf, +100 -20%, 500 wv	913 3013 00
C-5	Calibration signal coupling	CAPACITOR: ceramic; 1 mmf, $\pm 1/4$ mmf, 500 wv	916 0070 00
C-6	Padder for T-1	CAPACITOR: mica; 390 mmf, $\pm 2\%$, 500 wv	912 0535 00
C-7	Trimmer for T-1	CAPACITOR, variable: ceramic; 8-50 mmf; 350 wv	917 1075 00
C-8	Trimmer for T-2	CAPACITOR, variable: ceramic; 8-50 mmf; 350 wv	917 1075 00
C-9	Padder for T-2	CAPACITOR: mica; 650 mmf, $\pm 2\%$, 500 wv	912 0548 00
C-10	Padder for L-1	CAPACITOR: mica; 300 mmf, $\pm 2\%$, 500 wv	912 0526 00
C-11	Trimmer for L-1	CAPACITOR, variable: ceramic; 8-50 mmf, 350 wv	917 1075 00
C-12	Padder for L-2	CAPACITOR: mica; 120 mmf, $\pm 5\%$, 500 wv	912 0500 00
C-13	Trimmer for L-2	CAPACITOR, variable: ceramic; 8-50 mmf, 350 wv	917 1075 00
C-14	Padder for L-3	CAPACITOR: mica; 68 mmf, $\pm 5\%$, 500 wv	912 0482 00
C-15	Trimmer for L-3	CAPACITOR, variable: ceramic; 8-50 mmf, 350 wv	917 1075 00
C-16	Trimmer for T-7	CAPACITOR, variable: ceramic; 5-25 mmf, 350 wv	917 1073 00
C-17	Trimmer for L-10	CAPACITOR, variable: ceramic; 5-25 mmf, 350 wv	917 1073 00

TABLE 6-1 (Cont.)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C-18	Antenna Trimmer	CAPACITOR, variable: air; 2.6-19.7 mmf	922 0033 00
C-19	V-2 grid blocking	CAPACITOR: mica; 100 mmf, $\pm 10\%$, 500 wv	912 0495 00
C-20	V-2 grid decoupling	CAPACITOR: paper; .1 mmf, $\pm 10\%$, 400 wv	931 0299 00
C-21	V-2 screen bypass	CAPACITOR: ceramic; .01 mf, +100 -20%, 500 wv	913 3013 00
C-22	Padder for T-7	CAPACITOR: mica; 24 mmf, $\pm 10\%$, 500 wv	912 0450 00
C-23	Trimmer for L-6	CAPACITOR, variable: ceramic; 8-50 mmf, 350 wv	917 1075 00
C-24	Padder for L-6	CAPACITOR: mica; 650 mmf, $\pm 20\%$, 500 wv	912 0548 00
C-25	Padder for L-7	CAPACITOR: mica; 300 mmf, $\pm 2\%$, 500 wv	912 0526 00
C-26	Trimmer for L-7	CAPACITOR, variable: ceramic; 8-50 mmf, 350 wv	917 1075 00
C-27	Padder for L-8	CAPACITOR: mica; 120 mmf, $\pm 5\%$, 500 wv	912 0500 00
C-28	Trimmer for L-8	CAPACITOR, variable: ceramic; 8-50 mmf, 350 wv	917 1075 00
C-29	Padder for L-9	CAPACITOR: mica; 68 mmf, $\pm 5\%$, 500 wv	912 0482 00
C-30	Trimmer for L-9	CAPACITOR, variable: ceramic; 8-50 mmf, 350 wv	917 1075 00
C-31	Trimmer for L-10	CAPACITOR, variable: ceramic; 5-25 mmf, 350 wv	917 1073 00
C-32	Trimmer for L-10	CAPACITOR, variable: ceramic; 5-25 mmf, 350 wv	917 1073 00
C-33	V-2 plate decoupling	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-34	V-3 grid blocking	CAPACITOR: mica; 100 mmf, $\pm 10\%$, 500 wv	912 0495 00
C-35	V-3 cathode bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-36	V-3 screen bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00

TABLE 6-1 (Cont.)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C-37	V-3 injection coupling	CAPACITOR: mica; 100 mmf, $\pm 10\%$, 500 wv	912 0495 00
C-38	V-4 plate feedback	CAPACITOR: mica; 220 mmf, $\pm 10\%$, 500 wv	912 0519 00
C-39	Padder for L-18	CAPACITOR: mica; 47 mmf, $\pm 5\%$, 500 wv	912 0470 00
C-40	Padder for L-12	CAPACITOR: mica; 220 mmf, $\pm 10\%$, 500 wv	912 0519 00
C-41	Padder for L-13	CAPACITOR: mica; 130 mmf, $\pm 10\%$, 500 wv	912 0502 00
C-42	Padder for L-14	CAPACITOR: mica; 120 mmf, $\pm 10\%$, 500 wv	912 0501 00
C-43	Padder for L-15	CAPACITOR: mica; 110 mmf, $\pm 2\%$, 500 wv	912 0496 00
C-44	Padder for L-16	CAPACITOR: mica; 56 mmf, $\pm 10\%$, 500 wv	912 0477 00
C-45	Padder for L-17	CAPACITOR: mica; 47 mmf, $\pm 10\%$, 500 wv	912 0471 00
C-46	V-4 plate decoupler	CAPACITOR: ceramic; .01 mf, +100 -20%, 500 wv	913 3013 00
C-47	Padder for L-18	CAPACITOR: mica; 330 mmf, $\pm 2\%$, 500 wv	912 0529 00
C-48	V-3 plate decoupler	CAPACITOR: ceramic; .01 mf, +100 -20%, 500 wv	913 3013 00
C-50	Padder for L-10	CAPACITOR: mica; 39 mmf, $\pm 10\%$, 500 wv	912 0465 00
C-51	Padder for L-11	CAPACITOR: mica; 47 mmf, $\pm 10\%$, 500 wv	912 0471 00
C-52	Coupler for L-18 and L-22	CAPACITOR: ceramic; 4 mmf, $\pm 1/2$ mmf, 500 wv	916 0114 00
C-53	Trimmer for L-18	CAPACITOR, variable: ceramic; 8-50 mmf, 350 wv	917 1075 00
C-54	V-6 cathode bypass	CAPACITOR: paper; .1 mf, $\pm 10\%$, 150-200 wv	931 0333 00
C-55	Padder for L-22	CAPACITOR: mica; 330 mmf, $\pm 2\%$, 500 wv	912 0529 00
C-56	Trimmer for L-22	CAPACITOR, variable: ceramic; 8-50 mmf, 350 wv	917 1075 00
C-57	Padder for L-22	CAPACITOR: mica; 75 mmf, $\pm 10\%$, 500 wv	912 0485 00
C-58	Tweet trap series	CAPACITOR: mica; 270 mmf, $\pm 2\%$, 500 wv	912 0523 00
C-59	V-5 cathode bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00

Section VI
PARTS LIST

TABLE 6-1 (Cont.)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C-60	V-5 screen bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv (p/o L-27)	913 3013 00
C-61	Mechanical filter padder	CAPACITOR: mica; 100 mmf, $\pm 2\%$, 500 wv	912 0493 00
C-62	V-5 plate decoupling	CAPACITOR: paper; .1 mmf, $\pm 10\%$, 400 wv	931 0299 00
C-63	B+ bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-64	Mechanical filter padder	CAPACITOR: mica; 100 mmf, $\pm 2\%$, 500 wv	912 0493 00
C-65	V-6 grid decoupler	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-66	V-6 screen bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-67	V-6 plate decoupling	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-68	V-6 plate to V-7 grid coupler	CAPACITOR: mica; 470 mmf, $\pm 10\%$, 500 wv	912 0543 00
C-69	External padder for L-27	CAPACITOR: mica; 33 mmf, $\pm 20\%$, 500 wv	912 0457 00
C-70	V-7 plate bypass	CAPACITOR: paper; .1 mf, $\pm 10\%$, 400 wv	931 0299 00
C-71	V-7 plate blocking	CAPACITOR: mica; 1000 mmf, $\pm 10\%$, 500 wv	935 5067 00
C-72	Rejection filter tuning	CAPACITOR, variable: air; 2.6-19.7 mmf	922 0033 00
C-73	Padder for L-26	CAPACITOR: mica; 1000 mmf, $\pm 2\%$, 500 wv	935 5064 00
C-74	Padder for L-26	CAPACITOR: mica; 1000 mmf, $\pm 2\%$, 500 wv	935 5064 00
C-75	V-8 grid coupling	CAPACITOR: mica; 470 mmf, $\pm 10\%$, 500 wv	912 0543 00
C-76	V-8 grid decoupling	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-77	V-8 cathode bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-78	V-8 screen bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-79	V-8 plate decoupling	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-80	Padder for L-27	CAPACITOR: 100 mmf, part of L-27	

TABLE 6-1 (Cont.)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C-81	V-9 grid coupling	CAPACITOR: mica; 470 mmf, $\pm 10\%$, 500 wv	912 0543 00
C-82	V-9 grid decoupling	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-83	V-9 screen bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-84	V-9 plate decoupling	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-85	T-3 primary padder	CAPACITOR: 500 mmf, part of T-3	
C-86	T-3 secondary padder	CAPACITOR: mica; 510 mmf, $\pm 5\%$, 300 wv	912 0545 00
C-87	V-11 grid coupler	CAPACITOR: mica; 10 mmf, $\pm 10\%$, 500 wv	912 0432 00
C-88	T-3 secondary bypass	CAPACITOR: mica; 330 mmf, $\pm 5\%$, 500 wv	912 0530 00
C-89	V-11 plate bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-90	V-11 load filter	CAPACITOR: mica; 220 mmf, $\pm 10\%$, 500 wv	912 0519 00
C-91	V-11 load filter	CAPACITOR: mica; 220 mmf, $\pm 10\%$, 500 wv	912 0519 00
C-92	V-11 grid coupler from BFO	CAPACITOR: mica; 100 mmf, $\pm 10\%$, 500 wv	912 0495 00
C-93	AM detector audio output coupler	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-94 ABC	C-94A-Plate supply filter C-94B-Plate supply filter C-94C-V-11 plate decoupling	CAPACITOR: electrolytic; 40 mmf, -15% +100%, 300 wv	183 1115 00
C-95	CW detector audio output coupler	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-96	Noise limiter audio output coupler	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-97	V-12 cathode bypass	CAPACITOR: paper; .1 mmf, $\pm 10\%$, 400 wv	931 0299 00
C-98	V-12 plate decoupler	CAPACITOR: paper; .1 mmf, $\pm 10\%$, 400 wv	931 0299 00
C-99	V-11 grid divider	CAPACITOR: mica; 100 mmf, $\pm 10\%$, 500 wv	912 0495 00
C-100	V-13 grid coupling	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00

Section VI
PARTS LIST

TABLE 6-1 (Cont.)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C-101	V-22 grid coupling	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-102	V-22 grid decoupling	CAPACITOR: paper; 1 mf, +20-10% 200 wv	931 0170 00
C-103	V-22 plate stabilizing	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-104	V-21 grid coupling	CAPACITOR: mica; 470 mmf, $\pm 10\%$, 500 wv	912 0543 00
C-105	V-21 cathode bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-106	V-21 screen bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-107	V-21 plate decoupling	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-108	V-16 cathode filter	CAPACITOR: paper; .1 mf, $\pm 10\%$, 400 wv	931 0299 00
C-109	T-4 secondary tuning	CAPACITOR: mica; 510 mmf, $\pm 5\%$, 300 wv	912 0545 00
C-110	V-16 cathode filter	CAPACITOR: mica; 330 mmf, $\pm 5\%$, 500 wv	912 0530 00
C-111	V-16 plate bypass	CAPACITOR: paper; .1 mf, $\pm 10\%$, 400 wv	931 0299 00
C-112	AVC time constant	CAPACITOR: paper; .1 mf, $\pm 10\%$, 400 wv	931 0299 00
C-113	Bias supply filter	CAPACITOR: electrolytic; 50 mf, +100-10%, 150 wv	183 1045 00
C-114	V-9 cathode	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-115	Bias bypass	CAPACITOR: paper; .1 mf, $\pm 10\%$, 400 wv	931 0299 00
C-116	V-18 anode bypass	CAPACITOR: paper; .1 mf, $\pm 10\%$, 400 wv	931 0299 00
C-117	BFO tuning	CAPACITOR, variable: air; 23.7 mmf	922 0353 00
C-118	Trimmer for BFO	CAPACITOR, variable: air; 6-75 mmf	922 4200 00
C-119	Padder for BFO	CAPACITOR: mica; 1600 mmf, $\pm 1\%$, 500 wv	912 1729 00
C-120	Padder for BFO	(p/o L-31)	
C-121	V-20 grid blocking	CAPACITOR: mica; 100 mmf, $\pm 10\%$, 500 wv	912 0495 00
C-122	V-20 plate decoupling	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00

TABLE 6-1 (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C-123	V-20 screen bypass	CAPACITOR: ceramic; .01 mf, +100-20% 500 wv	913 3013 00
C-124	B+ bypass	CAPACITOR: paper; .5 mmf, +20%, -10% 200 wv	931 0169 00
C-125	T-4 primary tuning	CAPACITOR: 500 mmf, part of T-4	
C-126	115-V line bypass	CAPACITOR: ceramic; .01 mf, +100-20% 500 wv	913 3013 00
C-127	115-V line bypass	CAPACITOR: ceramic; .01 mf, +100-20% 500 wv	913 3013 00
C-128	V-20 feedback	CAPACITOR: ceramic; 4 mmf, $\pm 1/2$ mmf, 500 wv	916 0114 00
C-130	Mech. filter primary tuning	CAPACITOR: mica; 100 mmf, $\pm 2\%$, 500 wv	912 0493 00
C-131	Mech. filter secondary tuning	CAPACITOR: mica; 100 mmf, $\pm 2\%$, 500 wv	912 0493 00
C-132	Mech. filter primary tuning	CAPACITOR: mica; 100 mmf, $\pm 2\%$, 500 wv	912 0493 00
C-133	Mech. filter secondary tuning	CAPACITOR: mica; 100 mmf, $\pm 2\%$, 500 wv	912 0493 00
C-134		Not Used	
C-135		(p/o L-31)	
C-136		(p/o L-31)	
C-137	Bias supply filter	CAPACITOR: electrolytic; 50 mf, +100%, -10%, 150 wv	183 1045 00
C-138	Padder for C-31	CAPACITOR: mica; 10 mmf, $\pm 5\%$, 500 wv	912 0431 00
C-139	V-8 grid shunt	CAPACITOR: mica; 56 mmf, $\pm 5\%$, 500 wv	912 0476 00
C-140	Tweet trap tuning	CAPACITOR: ceramic; 18 mmf, $\pm 5\%$, 500 wv	916 4184 00
C-141	Muting circuit bypass	CAPACITOR: ceramic; .01 mf, +100-20%, 500 wv	913 3013 00
C-142	Pad for C-8	CAPACITOR: mica; 27 mmf; $\pm 5\%$; 500 wv	912 0452 00
C-143	Pad for C-23	CAPACITOR: mica; 27 mmf; $\pm 5\%$, 500 wv	912 0452 00
C-144	V-5 plate blocking	CAPACITOR: ceramic; .001 mf, +100-20%, 500 wv	913 1186 00
C-145	L-32 Resonating	CAPACITOR: mica; 62 mmf; $\pm 2\%$, 500 wv	912 0478 00
C-146	Filter	CAPACITOR: paper, .1 mf; $\pm 10\%$, 4 wv	931 0299 00
C-147	V-12 Cathode bypass	CAPACITOR: mica; 510 mmf; $\pm 5\%$, 300 wv	912 0545 00
C-148	V-12 Plate bypass	CAPACITOR: mica; 510 mmf; $\pm 5\%$, 300 wv	912 0545 00

TABLE 6-1 (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
E-1	Antenna input connector	STRIP: terminal; 3 screw term on bakelite board	306 0033 00
E-2	V-2 grid suppressor	PARASITIC SUPPRESSOR: 47 ohm; #24 bus wire	504 7064 00
E-3	Muting-standby connector	STRIP: terminal; 4 screw term on bakelite board	306 0034 00
E-4	Audio output connector	STRIP: terminal; 4 screw term on bakelite board	306 0034 00
F-1	Primary fuse	FUSE: cartridge; 2 amp, 125 v Slo-Blo 3AG	264 0297 00
I-1	Meter lamp	LAMP: part of M-1	
I-2	KILOCYCLE dial bulb	LAMP: pilot light bulb w/ miniature bayonet base	262 3240 00
I-3	Megacycle dial bulb	LAMP: pilot light bulb w/ miniature bayonet base	262 3240 00
I-4	Megacycle dial bulb	LAMP: pilot light bulb w/ miniature bayonet base	262 3240 00
J-1	Antenna Coaxial input	CONNECTOR, receptacle: single round female contact	357 9183 00
J-2	Headphone connector	JACK: phone; 2 circuit for 1/4" diam plug	360 0025 00
J-3	Diode load test	CONNECTOR, receptacle: single round female contact	360 0062 00
J-4	AVC test	CONNECTOR, receptacle: single round female contact	360 0064 00
L-1	40 meter RF	COIL, RF: single wnd, single layer wnd, 18 turns #28 AWG DS wire	504 7000 001
L-2	20 meter RF	COIL, RF: single wnd, single layer wnd, 9 turns #28 AWG DS wire	504 6999 001
L-3	15 meter RF	COIL, RF: single wnd, single layer wnd, 7 turns #28 AWG DS wire	504 6997 001
L-6	80 meter mixer	COIL, RF: single wnd, single layer wnd, 16 turns #26 AWG DS wire	504 7037 002
L-7	40 meter mixer	COIL, RF: single wnd, single layer wnd, 18 turns #28 AWG DS wire	504 7000 001
L-8	20 meter mixer	COIL, RF: single wnd, single layer wnd, 9 turns #28 AWG DS wire	504 6999 001
L-9	15 meter mixer	COIL, RF: single wnd, single layer wnd, 7 turns #28 AWG DS wire	504 6997 001
L-10	11-10-10 meter mixer	COIL, RF: single layer wnd, 6 turns @19 turns per inch	540 4608 00

TABLE 6-1 (Cont.)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
L-11	10 meter crystal (high freq.)	COIL, RF: 23, 31, 33 mc; single wnd, single layer wnd, 5 turns #28 AWG DS wire	504 7001 001
L-12	80 meter crystal	COIL, RF: 5.7 mc, single wnd, single layer wnd, 16 turns #28 AWG E wire	504 7004 001
L-13	40 meter crystal	COIL, RF: single wnd, single layer wnd, 12 turns #28 AWG DS wire	504 6998 001
L-14	20 meter crystal	COIL, RF: single wnd, single layer wnd, 7 turns #28 AWG DS wire	504 6997 001
L-15	15 meter crystal	COIL, RF: 23, 31, 33 mc; single wnd, single layer wnd, 5 turns #28 AWG DS wire	504 7001 001
L-16	11 meter crystal	COIL, RF: 23, 31, 33 mc; single wnd, single layer wnd, 5 turns #28 AWG DS wire	504 7001 001
L-17	10 meter crystal (low)	COIL, RF: 23, 31, 33 mc; single wnd, single layer wnd, 5 turns #28 AWG DS wire	504 7001 001
L-18	Variable IF. primary	COIL, RF: 1.5-2.5 mc, single wnd, single layer wnd, 52 turns #32 AWG E wire	504 7005 001
L-20	Tweet trap inductor	COIL, RF: single wnd, 3 pie universal wnd, 500 uh p/m 10%, at 1000 kc	240 0073 00
L-22	Variable IF. secondary	COIL, RF: 1.5-2.5 mc, single wnd, single layer wnd, 52 turns #32 AWG E wire	504 7005 001
L-23	5.7 mc tweet trap	COIL, RF: single pie, duo lat wnd, 124 turns litz wire	540 7017 002
L-24	V-16 plate	COIL, RF: 2 mh	240 0084 00
L-25	V-7 plate choke	COIL, RF: 2 mh	240 0084 00
L-26	Bridge T filter coil	COIL ASSY, Q Multiplier	540 4634 00
L-27	V-8 plate coil	COIL, RF: crystal filter grid; freq. range 440-470 kc (incl. C-60, C-80)	278 0085 00
L-28	V-11 detector output filter	COIL, RF: 2 mh	240 0084 00
L-29	Power supply filter	REACTOR: filter; 3.0 hy at 0.120 amp	668 0020 00
L-30	Power supply filter	REACTOR: filter; 5.0 hy at 0.080 amp	668 0019 00
L-31	BFO coil	COIL, RF: 70 turns (incl C-120, C-135, C-136)	540 3785 00
L-32	V-5 plate load	COIL, RF: 2 mh	240 0084 00

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TABLE 6-1 (Cont.)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
M-1	"S" meter	METER: single level; 1 ma DC, 50 ohm $\pm 20\%$, DC resistance, illuminated dial (incl. I-1)	458 0044 00
P-1	Antenna coaxial	CONNECTOR: male coax, UG-88/U	357 9018 00
P-2	Power connector	CONNECTOR: two conductor flexible AC cord	426 1003 00
R-1	V-1 grid	RESISTOR: 680,000 ohm $\pm 10\%$, 1/2 w	745 1471 00
R-2	V-1 cathode	RESISTOR: 4,700 ohm $\pm 10\%$, 1/2 w	745 1380 00
R-3	V-1 screen	RESISTOR: 100,000 ohm $\pm 10\%$, 1/2 w	745 1436 00
R-4	V-1 plate	RESISTOR: 220,000 ohm $\pm 10\%$, 1/2 w	745 1450 00
R-5	V-1 plate decoupling	RESISTOR: 10,000 ohm $\pm 10\%$, 1/2 w	745 1394 00
R-6	L-6 series	RESISTOR: 4,700 ohm $\pm 10\%$, 1/2 w	745 1380 00
R-7	V-2 grid	RESISTOR: 1.0 megohm $\pm 10\%$, 1/2 w	745 1478 00
R-8	V-2 grid decoupling	RESISTOR: 100,000 ohm $\pm 10\%$, 1/2 w	745 1436 00
R-9	V-6 cathode	RESISTOR: 2,500 ohms $\pm 20\%$, 1/4 w	376 4205 00
R-10	V-2 plate series	RESISTOR: 47 ohm $\pm 10\%$, 1/2 w	745 1296 00
R-11	V-2 screen	RESISTOR: 33,000 ohm $\pm 10\%$, 1/2 w	745 1415 00
R-12	V-2 plate decoupling	RESISTOR: 2,200 ohm $\pm 10\%$, 1/2 w	745 1366 00
R-13	V-3 grid	RESISTOR: 470,000 ohm $\pm 10\%$, 1/2 w	745 1464 00
R-14	V-3 cathode	RESISTOR: 120 ohm $\pm 10\%$, 1/2 w	745 1314 00
R-15	V-3 screen	RESISTOR: 4,700 ohm $\pm 10\%$, 2 w	745 5680 00
R-16	V-3 injection grid	RESISTOR: 22,000 ohm $\pm 10\%$, 1/2 w	745 1408 00
R-17	V-4 cathode	RESISTOR: 330 ohm $\pm 10\%$, 1/2 w	745 1331 00
R-18	V-4 cathode	RESISTOR: 330 ohm $\pm 10\%$, 1/2 w	745 1331 00
R-19	V-4 plate series	RESISTOR: 47 ohm $\pm 10\%$, 1/2 w	745 1296 00
R-20	V-4 grid	RESISTOR: 10,000 ohm $\pm 10\%$, 1/2 w	745 1394 00
R-21	V-4 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1366 00

TABLE 6-1 (Cont.)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R-22	V-3 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1366 00
R-23	V-5 grid	RESISTOR: 100,000 ohm $\pm 10\%$, 1/2 w	745 1436 00
R-24	V-5 cathode	RESISTOR: 68 ohm $\pm 10\%$, 1/2 w	745 1303 00
R-25	V-5 screen	RESISTOR: 8200 ohm $\pm 10\%$, 2 w	745 5691 00
R-26	V-5 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1366 00
R-27	V-6 grid decoupling	RESISTOR: 3.3 megohm $\pm 10\%$, 1/2 w	745 1499 00
R-28	V-6 "S" meter dropping	RESISTOR: 68,000 ohm $\pm 10\%$, 1/2 w	745 1429 00
R-29	L-24 shunt	RESISTOR: 15,000 ohm $\pm 10\%$, 1/2 w	745 1401 00
R-30	V-6 screen	RESISTOR: 47,000 ohm $\pm 10\%$, 1/2 w	745 1422 00
R-31	V-6 plate decoupling	RESISTOR: 2200 ohms $\pm 10\%$, 1/2 w	745 1366 00
R-32	V-7 cathode	RESISTOR: 680 ohm $\pm 10\%$, 1/2 w	745 1345 00
R-33	V-7 plate dropping	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1366 00
R-34	V-7 plate load	RESISTOR: 330,000 ohm $\pm 10\%$, 1/2 w	745 1457 00
R-35	Bridge T adjustor series	RESISTOR: 30,000 ohm $\pm 1\%$, 1/2 w	705 2166 00
R-36	Bridge T regeneration adjuster	RESISTOR: 10,000 ohm $\pm 20\%$, 1/4 w	376 4207 00
R-37	V-8 grid	RESISTOR: 1.0 megohm $\pm 10\%$, 1/2 w	745 1478 00
R-38	V-8 grid decoupling	RESISTOR: 22,000 ohm $\pm 10\%$, 1/2 w	745 1408 00
R-39	"S" meter bridge	RESISTOR: 150 ohm $\pm 10\%$, 1/2 w	745 1317 00
R-41	"S" meter SENS adjust	RESISTOR: 500 ohm $\pm 10\%$, 2 w, wire wound	750 8081 00
R-43	"S" meter zero	RESISTOR: 500 ohm $\pm 10\%$, 2 w, wire wound	750 8081 00
R-44	V-8 "S" meter dropping	RESISTOR: 68,000 ohm $\pm 10\%$, 1/2 w	745 1429 00
R-45	V-8 screen	RESISTOR: 47,000 ohm $\pm 10\%$, 1/2 w	745 1422 00
R-46	L-27 shunt	RESISTOR: 22,000 ohm $\pm 10\%$, 1/2 w	745 1408 00
R-47	V-8 plate decoupling	RESISTOR: 220 ohm $\pm 10\%$, 1/2 w	745 1366 00

*Some Receivers may have a 1000-ohm potentiometer with a fixed 1000 ohm resistor in shunt. Use the 500-ohm potentiometer here listed for replacement purposes without the 1000 ohm shunt resistor.

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TABLE 6-1 (Cont.)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R-48	V-9 grid	RESISTOR: 3.3 megohm $\pm 10\%$, 1/2 w	745 1499 00
R-49	V-9 grid decoupling	RESISTOR: 22,000 ohm $\pm 10\%$, 1/2 w	745 1408 00
R-50	T-3 primary shunt	RESISTOR: 4700 ohm $\pm 10\%$, 1/2 w	745 1422 00
R-51	V-9 screen	RESISTOR: 4700 ohm $\pm 10\%$, 1/2 w	745 1422 00
R-52	V-9 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1366 00
R-53	V-9 grid bleeder	RESISTOR: 68,000 ohm $\pm 10\%$, 1/2 w	745 1429 00
R-54	V-11 grid	RESISTOR: 100,000 ohm $\pm 10\%$, 1/2 w	745 1436 00
R-55	V-9 cathode	RESISTOR: 150 ohm $\pm 10\%$, 1/2 w	745 1317 00
R-56	V-10A diode load	RESISTOR: 22,000 ohm $\pm 10\%$, 1/2 w	745 1408 00
R-57	V-10A diode load	RESISTOR: 4700 ohm $\pm 10\%$, 1/2 w	745 1422 00
R-58	V-11 cathode	RESISTOR: 820 ohm $\pm 10\%$, 1/2 w	745 1349 00
R-59	V-11 grid	RESISTOR: 100,000 ohm $\pm 10\%$, 1/2 w	745 1436 00
R-60	V-11 plate load	RESISTOR: 47,000 ohm $\pm 10\%$, 1/2 w	745 1422 00
R-61	V-11 plate decoupling	RESISTOR: 15,000 ohm $\pm 10\%$, 1/2 w	745 1401 00
R-62	AF gain control	RESISTOR: 500,000 ohm $\pm 20\%$, 1/4 w	376 4499 00
R-63	V-12 plate load	RESISTOR: 470,000 ohm $\pm 10\%$, 1/2 w	745 1464 00
R-64	V-12 plate dropping	RESISTOR: 680,000 ohm $\pm 10\%$, 1/2 w	745 1471 00
R-65	V-12 cathode	RESISTOR: 220,000 ohm $\pm 10\%$, 1/2 w	745 1450 00
R-66	V-12 cathode	RESISTOR: 47,000 ohm $\pm 10\%$, 1/2 w	745 1422 00
R-67	Noise limiter adjust	RESISTOR: 500,000 ohm $\pm 20\%$, 1/2 w (Incl. S-4)	376 5701 00
R-68	V-12 plate load	RESISTOR: 220,000 ohm $\pm 10\%$, 1/2 w	745 1450 00
R-69	V-13 cathode	RESISTOR: 3300 ohm $\pm 10\%$, 1/2 w	745 1373 00
R-70	V-9 grid bleeder	RESISTOR: 470,000 ohm $\pm 10\%$, 1/2 w	745 1464 00
R-71	V-9 feedback	RESISTOR: 33,000 ohm $\pm 10\%$, 1/2 w	745 1415 00
R-72	V-13 plate load	RESISTOR: 270,000 ohm $\pm 10\%$, 1/2 w	745 1454 00

TABLE 6-1 (Cont.)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R-73	V-13 plate load	RESISTOR: 270,000 ohm $\pm 10\%$, 1/2 w	745 1454 00
R-74	V-13 cathode	RESISTOR: 3300 ohm $\pm 10\%$, 1/2 w	745 1373 00
R-75	V-13 grid	RESISTOR: 470,000 ohm $\pm 10\%$, 1/2 w	745 1464 00
R-76	V-22 grid	RESISTOR: 100,000 ohm $\pm 10\%$, 1/2 w	745 1436 00
R-77	V-22 grid bias series	RESISTOR: 180,000 ohm $\pm 10\%$, 1/2 w	745 1447 00
R-78	Audio load	RESISTOR: 10 ohm $\pm 10\%$, 2 w	745 9013 00
R-81	V-21 grid	RESISTOR: 1.0 megohm $\pm 10\%$, 1/2 w	745 1478 00
R-82	V-21 cathode	RESISTOR: 150 ohm $\pm 10\%$, 1/2 w	745 1317 00
R-83	V-21 screen	RESISTOR: 47,000 ohm $\pm 10\%$, 1/2 w	745 1422 00
R-84	V-21 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1366 00
R-85	T-4 primary shunt	RESISTOR: 47,000 ohm $\pm 10\%$, 1/2 w	745 1422 00
R-86	V-16 diode load	RESISTOR: 39,000 ohm $\pm 10\%$, 1 w	745 3419 00
R-87	V-16 diode load	RESISTOR: 3300 ohm $\pm 10\%$, 1/2 w	745 1373 00
R-88	V-16 plate load	RESISTOR: 2.2 megohm $\pm 10\%$, 1/2 w	745 1492 00
R-89	V-16 diode load	RESISTOR: ^{20K} ~~10,000~~ ohm $\pm 10\%$, 1/2 w	745 1394 00
R-90	AVC time constant	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1366 00
R-91	AVC time constant "fast"	RESISTOR: 330,000 ohm $\pm 10\%$, 1/2 w	745 1457 00
R-92	AVC time constant "slow"	RESISTOR: 3.3 megohm $\pm 10\%$, 1/2 w	745 1499 00
R-93	RF gain bleeder	RESISTOR: 330,000 ohm $\pm 10\%$, 1/2 w	745 1457 00
R-94	Voltage regulator dropping	RESISTOR: 2500 ohm $\pm 10\%$, 10 w	710 0030 00
R-95	V-19 plate series	RESISTOR: 1000 ohm $\pm 10\%$, 1/2 w	745 1352 00
R-96	Bias rectifier filter	RESISTOR: 4700 ohm $\pm 10\%$, 1/2 w	745 1380 00
R-97	Bias rectifier filter	RESISTOR: 15,000 ohm $\pm 10\%$, 1/2 w	745 1401 00
R-98	Standby bias divider	RESISTOR: 22,000 ohm $\pm 10\%$, 1/2 w	745 1408 00
R-99	RF gain control	RESISTOR: 10,000 ohm $\pm 20\%$, 1/2 w	376 3522 00
R-100	V-20 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1366 00

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TABLE 6-1 (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R-101	V-20 grid	RESISTOR: 150,000 ohm $\pm 10\%$, 1/2 w	745 1443 00
R-102	V-20 plate	RESISTOR: 100,000 ohm $\pm 10\%$, 1/2 w	745 1436 00
R-103	V-20 screen	RESISTOR: 150,000 ohm $\pm 10\%$, 1/2 w	745 1443 00
R-104	RF gain series	RESISTOR: 270 ohm $\pm 10\%$, 1/2 w	745 1328 00
R-105	V-7 grid	RESISTOR: 100,000 ohm $\pm 10\%$, 1/2 w	745 1436 00
R-106	V-20 B+ divider	RESISTOR: 10,000 ohm $\pm 10\%$, 1/2 w	745 1394 00
R-107	V-12 filament dropping	RESISTOR: 10 ohm $\pm 10\%$, 2 w	745 5568 00
R-108	AVC bleeder	Deleted	
R-109	Audio Feedback	RESISTOR: 390,000 ohm $\pm 10\%$, 1/2 w	745 1461 00
R-110	V-7 grid	RESISTOR: 47 ohm $\pm 10\%$, 1/2 w	745 1296 00
R-111	V-20 grid series	RESISTOR: 47 ohm $\pm 10\%$, 1/2 w	745 1296 00
R-112	V-22 screen	RESISTOR: 3300 ohm $\pm 10\%$, 1 w	745 3373 00
R-113	V-7 Parasitic suppressor	RESISTOR: 120 ohm $\pm 10\%$, 1/2 w	745 1314 00
R-114	V-5 Parasitic suppressor	RESISTOR: 47 ohm $\pm 10\%$, 1/2 w	745 1296 00
R-115	Limiter bias bleeder	RESISTOR: 1200 ohm $\pm 10\%$, 1/2 w	745 1356 00
R-116	Limiter bias series	RESISTOR: 100,000 ohm $\pm 10\%$, 1 w	745 3436 00
R-117	Filter	RESISTOR: 47,000 ohm $\pm 10\%$, 1/2 w	745 1422 00
R-118	NL Feedback	RESISTOR: 6800 ohm $\pm 10\%$, 1/2 w	745 1387 00
R-130	IF GAIN divider	RESISTOR: 56K $\pm 10\%$, 2 w	745 5726 00
R-131	AVC diode load	RESISTOR: 330K $\pm 10\%$, 1/2 w	745 1457 00
S-1A	Band switch, ant coil sel.	SWITCH SECTION, rotary: 2 circuit, 12 position, shorting	269 1689 00
S-1B	Band switch, RF coil sel.	SWITCH SECTION, rotary: 2 circuit, 12 position, shorting	269 1690 00
S-1C	Band switch, mixer coil sel.	SWITCH SECTION, rotary: 2 circuit, 12 position, shorting	269 1690 00
S-1D	Band switch, crystal sel.	SWITCH SECTION, rotary: 1 circuit, 12 position, shorting	269 1688 00
S-1E	Band switch, crystal coil sel.	SWITCH SECTION, rotary: 1 circuit, 12 position, shorting	269 1688 00
S-1F	Band switch, 10-10-11 meter padder selector	SWITCH SECTION, rotary: 1 circuit, 12 position, shorting	269 1691 00
S-2	S-2A, S-2B	SWITCH, rotary: detent, 3 position 30° angle of detent	269 1435 00

TABLE 6-1 (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
S-2A	Mechanical filter primary selector	SWITCH SECTION, rotary: 1 circuit, 12 position, shorting	269 1666 00
S-2B	Mechanical filter secondary selector	SWITCH SECTION, rotary: 1 circuit, 12 position, shorting	269 1667 00
S-3	AM-CW-SSB selector switch	SWITCH, rotary: 4 circuit, 2 position, non-shorting	259 0655 00
S-4	Noise limiter on-off	SWITCH: part of R-67	
S-5	AVC selector switch	SWITCH, rotary: 2 circuit, 3 position, non-shorting	259 0417 00
S-6	OFF-STANDBY-ON-CAL selector switch	SWITCH, rotary: 3 circuit, 4 position, positive shorting	259 0656 00
T-1	160 meter RF coil	COIL, RF: two wnd, single layer wnd, one wnd, w/51 turns, other wnd w/4 turns	504 7038 002
T-2	80 meter RF coil	COIL, RF: two wnd, single layer wnd, one wnd, w/16 turns, other wnd w/3 turns	504 7039 002
T-3	455 KC IF. coil	TRANSFORMER: intermediate freq. 455; freq. range 440-470 KC (incl. C-85)	278 0197 00
T-4	AVC 455 KC IF. coil	TRANSFORMER: intermediate freq. 455; freq. range 440-470 KC	278 0197 00
T-5	Audio output transformer	TRANSFORMER: audio output; pri 5000 ohm; secd 500 ohm tapped at 4 ohm, 2500 TV	667 0018 00
T-6	Power transformer	TRANSFORMER, power: pri 115 v, secd #1; 100 v CT, secd #2; 5.0 v secd #3; 6.3 v 1500 TV, 50/60 cps	662 0145 00
T-7	11-10-10 meter RF coil	COIL ASSY: 6 turns @ 19 turns per inch	540 4609 00
V-1	Calibrator	TUBE: type 6BA6; pentode	255 0185 00
V-2	RF amplifier	TUBE: type 6DC6; pentode	255 0226 00
V-3	First mixer	TUBE: type 6BA7; pentagrid	255 0209 00
V-4	HF crystal osc.	TUBE: type 12AT7; double triode	255 0205 00
V-5	Second mixer	TUBE: type 6BA7; pentagrid	255 0209 00
V-6	Mechanical filter 455 IF. amplifier	TUBE: type 6BA6; pentode	255 0185 00
V-7	"Q" multiplier	TUBE: type 12AX7; double triode	255 0201 00

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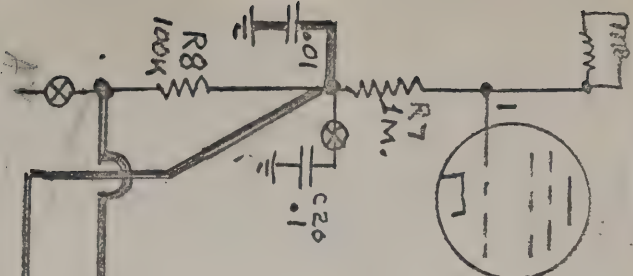
TABLE 6-1 (Cont.)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
V-8	455 KC IF. amplifier	TUBE: type 6BA6; pentode	255 0185 00
V-9	455 KC IF. amplifier	TUBE: type 6BA6; pentode	255 0185 00
V-10	AM detector muting diode	TUBE: type 6AL5; double diode	257 0018 00
V-11	CW-SSB detector	TUBE: type 12AU7; twin triode	255 0199 00
V-12	Noise limiter	TUBE: type 6AL5; double diode	257 0018 00
V-13	Audio amplifier	TUBE: type 12AT7; double triode	255 0205 00
V-14	VFO oscillator	TUBE: type 6BA6; pentode	255 0250 00
V-15	VFO amplifier	TUBE: type 6BA6; pentode	255 0250 00
V-16	AVC Det-noise clipper	TUBE: type 6AL5; double diode	257 0018 00
V-17	Power rectifier	TUBE: type 5Y3GT; full wave rectifier	255 0157 00
V-18	Voltage regulator	TUBE: type OA2	257 0052 00
V-19	RF gain gate - Bias rectifier	TUBE: type 6AL5; double diode	257 0018 00
V-20	BFO	TUBE: type 6BA6; pentode	255 0185 00
V-21	AVC amplifier	TUBE: type 6BA6; pentode	255 0185 00
V-22	Audio output	TUBE: type 6AQ5; beam pentode	255 0195 00
XF-1	Holder for F-1	FUSE HOLDER: extractor post for 3AG fuse	265 1002 00
XFL-1	Socket for Mechanical filter	SOCKET, tube: 9 contact miniature	220 1216 00
XFL-2	Socket for Mechanical filter	SOCKET, tube: 9 contact miniature	220 1216 00
XFL-3	Socket for Mechanical filter	SOCKET, tube: 9 contact miniature	220 1216 00
XI-3	Socket for I-3	LAMP HOLDER: bracket for miniature bayonet base bulb	262 1210 00
XI-4	Socket for I-4	LAMP HOLDER: bracket for miniature bayonet base bulb	262 1210 00
XV-1	Socket for V-1	SOCKET, tube: 7 contact miniature	220 1034 00
XV-2	Socket for V-2	SOCKET, tube: 7 contact miniature	220 1034 00
XV-3	Socket for V-3	SOCKET, tube: 9 contact miniature	220 1062 00
XV-4	Socket for V-4	SOCKET, tube: 9 contact miniature	220 1062 00

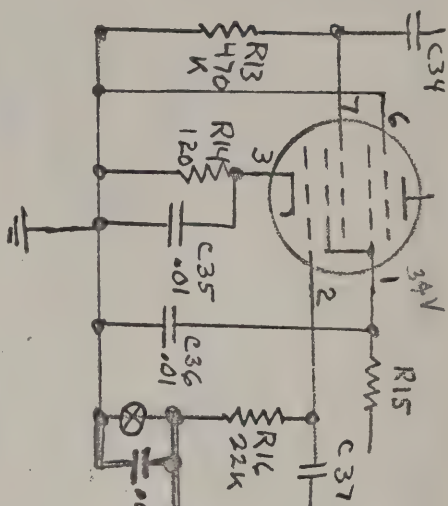
TABLE 6-1 (Cont.)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
XV-5	Socket for V-5	SOCKET, tube: 9 contact miniature	220 1062 00
XV-6	Socket for V-6	SOCKET, tube: 7 contact miniature	220 1034 00
XV-7	Socket for V-7	SOCKET, tube: 9 contact miniature	220 1062 00
XV-8, XV-9, XV-10	Socket for V-8, V-9, V-10	SOCKET, tube: 7 contact miniature	220 1034 00
XV-11	Socket for V-11	SOCKET, tube: 9 contact miniature	220 1062 00
XV-12	Socket for V-12	SOCKET, tube: 7 contact miniature	220 1034 00
XV-13	Socket for V-13	SOCKET, tube: 9 contact miniature	220 1052 00
XV-16	Socket for V-16	SOCKET, tube: 7 contact miniature	220 1034 00
XV-17	Socket for V-17	SOCKET, tube: 8 contact miniature	220 1157 00
XV-18, XV-19	Socket for V-18, V-19	SOCKET, tube: 7 contact miniature	220 1046 00
XV-20 XV-21	Socket for V-20, V-21	SOCKET, tube: 7 contact miniature	220 1034 00
XV-22	Socket for V-22	SOCKET, tube: 7 contact miniature	220 1046 00
XY-1	Socket for Y-1	SOCKET, crystal: crystal holders with .094 dia. pins spaced 500	292 0055 00
Y-1	Calibrator crystal	CRYSTAL: 100 KC	291 5954 00
Y-2	80 meter crystal	CRYSTAL: 5.7 mc	291 8070 00
Y-3	40 meter crystal	CRYSTAL: 9.3 mc	291 8071 00
Y-4	20 meter crystal	CRYSTAL: 16.5 mc	291 8072 00
Y-5	15 meter crystal	CRYSTAL: 23.0 mc	290 8439 00
Y-6	11 meter crystal	CRYSTAL: 29 mc	291 8076 00
Y-7	10 meter crystal	CRYSTAL: 30.5 mc	291 8077 00
Y-8	10 meter crystal	CRYSTAL: 31.5 mc	291 8078 00
70E-24	OSCILLATOR (VFO)	This unit has been dehydrated and hermetically sealed, and should be returned to the Collins Radio Company if servicing is required.	
455 J-05 (500 cps)	MECHANICAL FILTER	This unit has been dehydrated and hermetically sealed, and should be returned to the Collins Radio Company if servicing is required.	526 9154 00
455 J-31 (3.1 kc)			526 9089 00
455 J-60 (6.0 kc)			526 9091 00
	VERNIER TUNING KNOB		541 6291 001

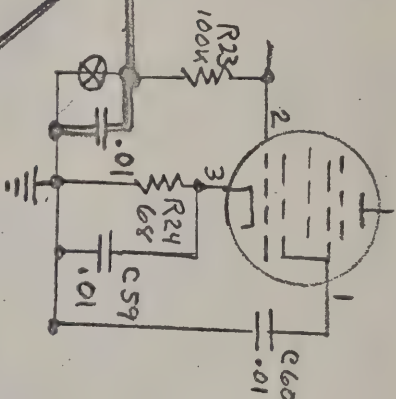
R.F. AMP
V2
6DC6



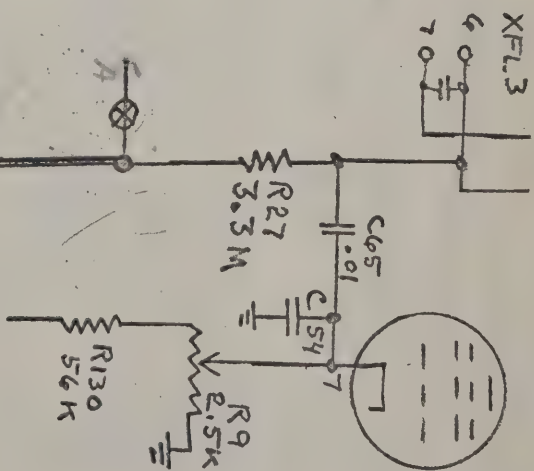
1ST Mix
V3
6BA7



2ND Mix
V5
6BA7

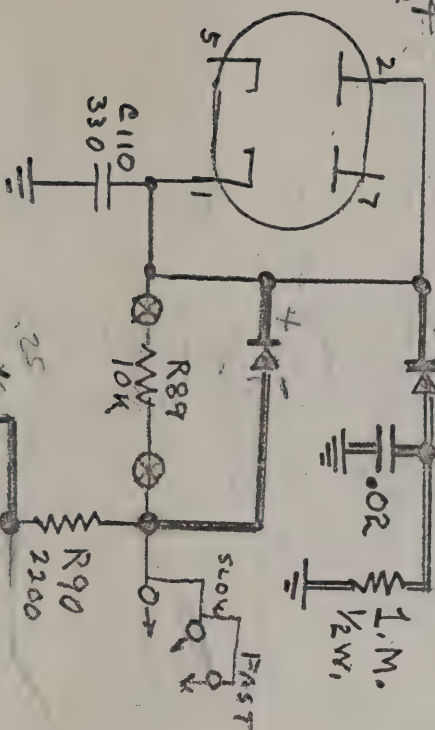


I.F. AMP
V6
6BA6

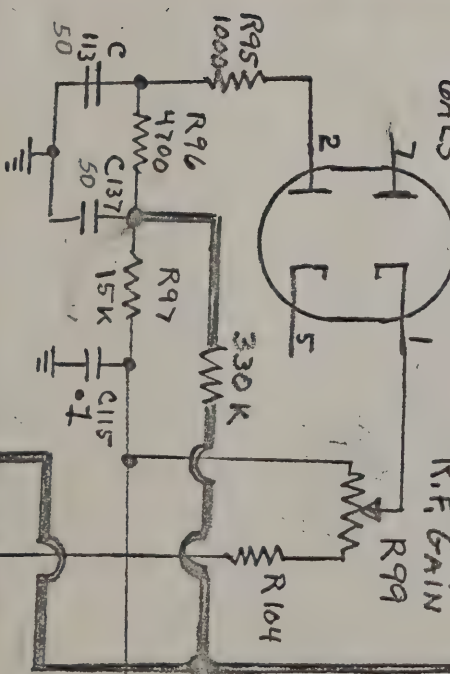


HEAVY LINES ARE
NEW WIRING

AVE DET &
CLIPPER
V16
6AL5



BIAS RECT
V19
6AL5



NOTE

T0
S6

OVER

I tried this dual AVC circuit some years
back, however it would motor boat on
very strong sigs. Remove all wiring
except that pertaining to the mixers V_3, V_5
& Bias Rect V_{19} .

Press side of sub chassis
to remove.

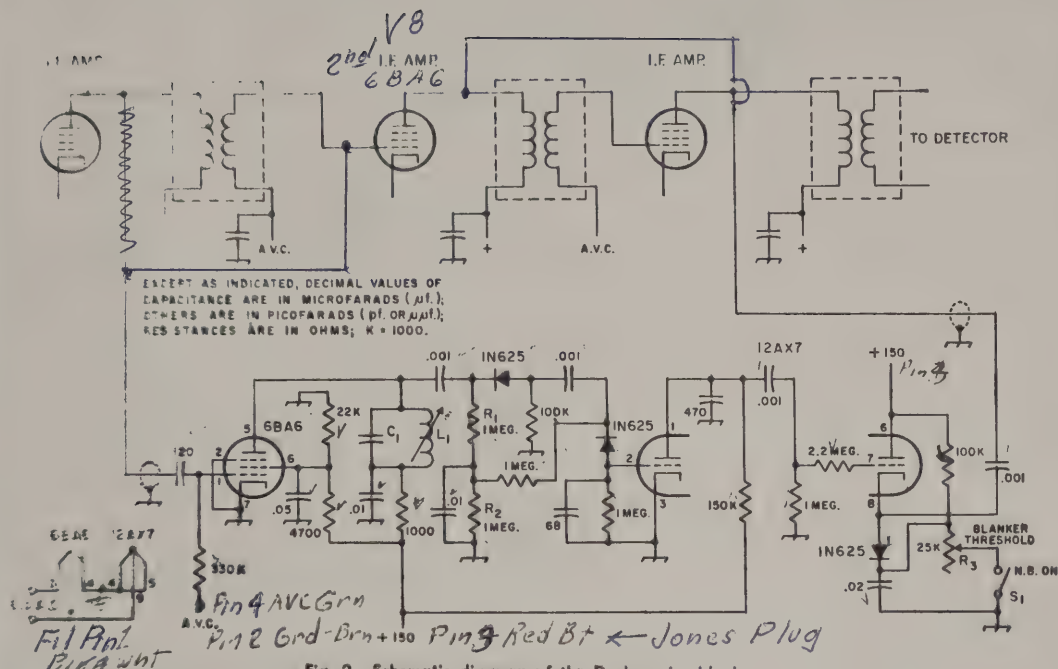


Fig. 2—Schematic diagram of the Drake noise blanker.
Capacitors are disk ceramics, and resistors are 1/2-watt.

C₁—Capacitor contained in the i.f. transformer used for L₁.
L₁—One section of a 455-kc. i.f. transformer (detune the other section).

R₁, R₂—1-megohm, 1/2-watt resistor.
R₃—25,000-ohm linear taper control.
S₁—S.p.s.t. toggle switch.

some component values
may be different from
those listed.

USING THE DRAKE NOISE BLANKER

AFTER trying several noise-blanker circuits, I tried the one used by Drake in the R4 receiver—this one really works. The circuit shown in Fig. 2 was built into my home-constructed receiver.

The blanking pulse was first connected to the first i.f. stage, but the circuit did not work well. Connecting the blanking pulse to the last i.f. stage made the unit perform as it should.

The noise is amplified in the 6BA6 amplifier, and rectified by the 1N625 pulse detector. A noise pulse causes a negative pulse to appear on the grid of the first half of the 12AX7, which cuts this stage off, while the resulting positive pulse in the plate circuit causes the second section to conduct. The plate of the last i.f. stage is grounded for r.f. during the time the second half of the 12AX7 is conducting, through the diode in the 12AX7's cathode circuit. The 25,000-ohm control applies positive bias voltage to the cathode of the second half of the 12AX7 for threshold control.

The blunker is connected to the receiver by short lengths of RG-58/U cable. The i.f. stages must be realigned to compensate for the capacitance of the cables. Then a v.t.v.m. is connected to the junction of R₁ and R₂ and L₁ is adjusted for maximum. The threshold control is set for best blanking action without distortion of the audio. —Jim Brunson, K8JC.

CRYSTAL OSCILLATOR FOR THE 32V

THIS crystal oscillator was designed for use on TMARS and traffic frequencies when using the Collins 32V series transmitters, which are normally v.f.o. control only. Novices may also make use of this adapter if the transmitter power input is held to 75 watts. The unit is constructed on a small chassis which is placed inside the 32V. When crystal operation is desired, the 6SJ7GT in the p.t.o. is removed and placed in the crystal-oscillator circuit. P₁ is then placed in the p.t.o. tube socket. To change back to v.f.o. operation, P₁ is removed and the 6SJ7GT moved back to the p.t.o.—Peter Kimball, K1YER.

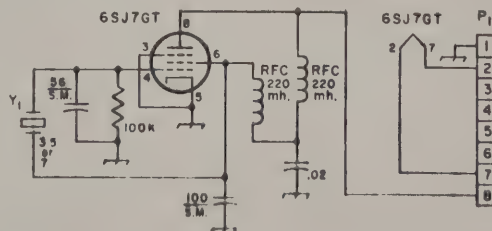


Fig. 3—Circuit for a crystal-oscillator adapter for Collins 32V series transmitters. Resistances are in ohms (K = 1000); decimal values of capacitance are in microfarads (μ f.), others are in picofarads (pf.). SM indicates silver mica capacitors. P₁ is an octal plug.



COLLINS RADIO COMPANY

CEDAR RAPIDS, IOWA, U.S.A.

February 2, 1959

CABLE
COLINRAD

Charles K. Morgan, W6DSX
Box 201
Paradise, California

Dear Mr. Morgan:

WØSYF mentioned to me that you are having some trouble calibrating your 32S-1 with your 75A-4. I have done this satisfactorily in my own station as follows:

1. Connect the 75A-4 500 ohm output terminal ^{7c} ~~the~~ the ANTI-VOX jack on the 32S-1.
2. Connect the 75A-4 standby terminals (1 and 2) to the receiver mute jack on the 32S-1.
3. Connect the 75A-4 ant. to the Rec. Ant jack on the 32S-1.
4. Operate the 75A-4 in STANDBY position.

To zero beat your 32S-1 to your receiver, turn 32S-1 to SYNC. Turn 32S-1 main tuning dial to the same frequency as 75A-4. A chirping sound should be heard. Tune 32S-1 very slowly across the frequency. The rate of chirping should change but not the pitch. Stop when the chirps occur two or three per second. This means your transmitter is zero beat to within 2 or 3 cycles, much closer than would be possible by conventional zero-beating techniques.

You may have to experiment with the position of your 75A-4 gain controls and/or the MIC Gain on the 32S-1 for most pleasing action.

Best 73's,

COLLINS RADIO COMPANY

Eugene Senti, WØROW
Engr. Dept. 13

ES:hg

CC: E. W. Pappenfus, WØSYF



Cedar Rapids, Iowa

telephone : area code 319, 365-8411

cable : COLINRAD

27 December 1963

Mr. C. K. Morgan - W6DSX
Skyway Lodge
P. O. Box 201
Paradise, California - 95969

Thank you very much, Mr. Morgan,

for your recent inquiry about the AVC in your 75A-4. No modifications were made to the AVC in the receiver during its entire run; however, all of the service bulletins issued for this receiver are enclosed for your information.

It is a pleasure to hear from you, Mr. Morgan. Should you need assistance at any time, please feel free to get in touch with us. Our Best Wishes to you for the New Year.

Very truly yours,

Doug Horner - W9TLY/WØHUF
Service Engineer
Amateur Radio Sales

km

Enclosure

*I did not do this because
I did not think I had a hum
problem s/p1*

SUBJECT B
MODIFICATION TO REDUCE HUM IN 75A-4

An investigation of the hum present in the 75A-4 has shown that the four leads from the power transformer (T6) to the rectifier tube (V17) seem to be coupling rectified pulses into the circuitry of the BFO (V20). Shielding of these wires eliminate these pulses from the BFO circuitry.

In addition, the lead from the arm of the audio gain control R62 to pin 2 of V13 is tied in the cable in the audio chassis and is picking up some hum. Rerouting of this lead and the use of a shielded lead reduces this hum pick up.

Production units with serial numbers above 2715 incorporate these modifications. The following procedure is recommended for use on receivers with lower serial numbers which will substantially reduce the amount of hum present in the receiver. Refer to Figure 2.

1. Remove bottom cover from chassis.
2. Remove front panel from chassis.
3. Remove the yellow wires from V17 pins 2 and 8.
4. Remove the red wires from V17 pins 4 and 6.
5. Insert four wires removed in Step 3 and 4 above into shielding, CPN 425 0040 00.
6. Ground each end of shielding.
7. Resolder yellow wires to pins 2 and 8 of V17.
8. Resolder red wires to pins 4 and 6 of V17.
9. Unsolder wire from center contact of AF Gain, R62, on front panel. Tape this wire on to cabling.
10. Unsolder wire from pin 2 of V13 and tape this wire on to cabling.
11. After inserting shielded wire, CPN 439 7907 00 into sleeving, CPN 152 1312 00, connect this wire from center contact of R62 to pin 2 of V13. Route this wire as shown in Figure 2.

Additional parts required: Modification kit 542 0851 00 - Price \$0.83

<u>Qty</u>	<u>Description</u>	<u>Collins Part Number</u>
0.6	Shielding (FT.)	425 0040 00
2	Wire, Shielded (FT.)	439 7907 00
1.8	Sleeving (FT.)	152 1312 00

SUBJECT C
NOISE LIMITER MODIFICATION

Recent research on the general subject of noise limiters and in particular on the noise limiter circuit used in the 75A-4 has prompted a modification to this circuit. The capacitors C147 and C148 were added to change the audio response characteristics of the receiver to a more desirable shape. They reduce the high frequency response and eliminate most of the high frequency components encountered in the pulse type noise. An additional section of filtering in the noise limiter bias supply has been incorporated to prevent any pulses that may appear on the AVC line and/or bias supply from feeding back through the noise limiter (V12). The bypass capacitors of both sections of this filter are now returned to the high side of a resistor (R118) which has been added to the AM detector circuit. This feeds a small amount of the pulses detected in the AM position to the cathode of the noise limiter. However, these pulses are out of phase with the pulses coming in on the plate and therefore help cancel out the pulses going through the noise limiter.

A noise pulse, when generated, is usually of a high amplitude and short time duration. This means that it contains many harmonics, or could be said to have a very wide bandwidth. So when a noise pulse is fed through a highly selective tuned circuit or a mechanical filter, only a certain portion of the original frequencies will come through. This has the effect of making a low amplitude and long time duration pulse out of what was originally a high amplitude and short time duration pulse. This means that even with the best limiter available it is sometimes very difficult to obtain much limiting action without also limiting the desired signal.

A very good explanation of this effect was given in an article by George Grammer, WIDF, in the May 1946 issue of QTS magazine. We quote a portion of that article to help clarify the explanation of the effect of selectivity on noise pulses.

NOISE PULSES AND SELECTIVITY

Fig. 1 gives a qualitative picture of noise and signal, but is by no means accurate in a quantitative sense when the circuit in which the oscillations exist is an IF amplifier operating in the vicinity of 450 kc. The number of cycles in the damped oscillation -- and therefore the length of time the oscillation persists, since the frequency is fixed -- is primarily a function of the Q of the circuit; the higher the Q the larger the number of cycles before the oscillation amplitude decays to a given fraction of the maximum amplitude. The normal 456 kc IF amplifier has an effective Q of such magnitude that even when excited by a signal pulse, several hundred cycles will occur before the amplitude dies down to a 1 per cent of its maximum value. Since Q and selectivity are directly related, an increase in selectivity brings with it an increase in the time required for damped oscillations to die down. This has an important bearing on noise reduction.

The noise that remains after full clipping will interfere to the extent that it tends to wipe out part of the beat note, and this in turn is a

function of the length of time during which the noise exists. If the noise pulse is very short it may wipe out only a cycle or two of a beat frequency which usually lies between 500 and 1000 cycles per second, and the loss of one or two cycles is not likely to be noticed. On the other hand, if the time duration of the noise pulse is great enough the signal may be unreadable even though the maximum noise amplitude is limited to that of the signal. Since the time duration of the r-f noise oscillations increases with the selectivity of the IF amplifier, the rectified envelope of the noise pulse likewise lasts longer, and the effectiveness of a limiter decreases when the receiver selectivity is increased.

The seriousness of pulse lengthening depends upon the original strength of the pulse and the rate of pulse recurrence. The stronger the pulse the longer the time required for the amplitude to die down to a fixed level, and if the pulses occur in rapid succession they may even overlap when lengthened out by selectivity. The rate of recurrence of most noises seems to be in the neighborhood of 120 per second (many noises are associated with the power-line frequency) so the time during which the noise pulse amplitude is comparable to that of the desired signal has to be held to considerably less than 1/120th second if limiting is to do any good.

The effect of selectivity on the shape of noise pulses can be observed quite readily on an oscilloscope if a recurrent pulse is available for examination. Fig. 4 shows progressively increasing selectivity from normal IF to the maximum available with a crystal filter. Note that the selectivity reduces the maximum amplitude in addition to increasing the time duration. It is entirely possible for the maximum pulse amplitude to be reduced to such an extent that it does not exceed the amplitude of the desired signal--in which event, although limiting is useless, there is nevertheless an improvement in the signal-to-noise ratio. The effect is readily observable by switching a crystal filter in and out when there is ignition noise of moderate strength; it usually makes the difference between copying and not copying a weak signal. Yet with normal IF selectivity and a good limiter it would be possible to clip the noise pulses so effectively they would not even be heard. It would be easy to interpret this last statement to mean that high selectivity is somewhat of a handicap in the presence of impulse noise, but despite the fact that there are occasions when it becomes possible to copy a signal with normal IF selectivity, plus limiting, and impossible to copy the same signal through a crystal filter, it would not pay to jump to such a conclusion.

CONTINUOUS NOISE

In the final analysis all noise is of a pulse-like nature, but when the pulses are random and occur so frequently that they overlap even though they are of extremely short duration, the result is a hiss-like noise of more or less uniform average intensity. This is the familiar receiver hiss, much of it generated in the circuits and tubes, but some of it similarly random noise picked up by the

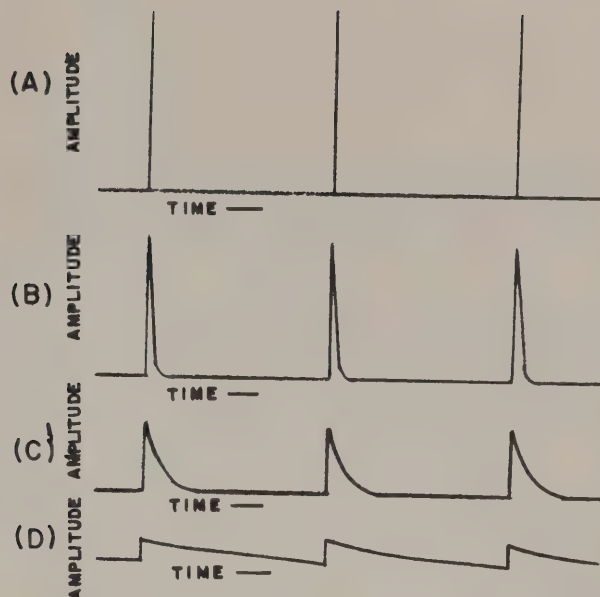


Fig. 4—Effect of increasing selectivity on the shape of noise pulses. (A) shows the pulse as it might appear with normal i.f. selectivity, (B) with a broad crystal filter, (C) and (D) with progressively increasing selectivity. These drawings, although not to true amplitude scale, shows the effect of high selectivity in decreasing the amplitude of a pulse. They were made from oscilloscope patterns using a loran signal, the pulse intervals being approximately 1/16th second. With maximum selectivity (D) most of the pulse interval is required for the pulse amplitude to decrease to a negligible value.



Fig. 1—Representation of noise impulses compared with a continuous carrier.

antenna. The energy distribution does not exist in short, high-amplitude bursts with relatively long silent periods between; it is continuous in time and there is no sense in expecting a limiter to reduce it.

On the other hand, this is the very type of noise that is reduced by increased selectivity; it is spread out over the whole frequency spectrum and the higher the selectivity the smaller the amount of it that is passed out by the selective circuits. Weak signals that are unreadable in the hiss noise with normal IF selectivity become readable with a crystal filter because the selectivity reduces the noise without changing the signal strength. When impulse noise is added to the hiss it may or may not be possible to copy a signal through the filter, but it certainly will not be possible without it even though the limiter does a perfect job of taking out the noise impulses. However, if the signal can be copied through the hiss with normal IF selectivity a good limiter usually will prevent impulse noise from interfering; whether or not the same signal can be copied with the crystal filter is a matter of the amplitude and character of the noise and the degree of selectivity. Ultimately, the noise pulses passing through the filter may result in a continuous "ringing" through which no signal can be copied, simply because the pulses are of such amplitude and have been lengthened to such an extent that they overlap to produce what is practically a continuous wave. This requires a noise amplitude such that with normal IF selectivity and without limiting, the signal is so deeply buried in noise as to be completely undiscernible to the ear. But if the noise is of the high-amplitude, short-duration character a good limiter will not only make the signal audible but make it perfectly readable.

This makes a convincing demonstration of the usefulness of a noise limiter, but the occasions when it can be done are relatively infrequent. The more common case is the one where the noise amplitude is such that either the crystal or normal-IF-plus-limiter will make the signal readable. With the filter, the limiter gets only an occasional chance to work because the noise amplitude is reduced by the selectivity; the result is that the impulse noise is there even though it may not prevent making perfect copy. With the normal-IF-plus-limiter the noise may be eliminated almost 100 per cent but the hiss is much stronger and the selectivity against other stations is much reduced. Which is better depends upon the operator's likes and the conditions--noise and other interference--existing at the moment.

There are at least two other types of noise that tend to be continuous and therefore hard to handle with a limiter insofar as increasing signal readability is concerned. One is natural static; if it is stronger than the signal the latter is likely to be blotted out completely for the duration of the crash. The other is associated with some electrical devices in which the sparking appears to be practically continuous during the half of each a-c alternation when the voltage is highest, with the result that for about half the time the noise pulses are

overlapping. When a limiter is applied on such a noise the residue is a throttled-sounding buzz.

The End

Since the effective Q of the mechanical filters used in the 75A-4 is relatively high, it can be seen that a problem with impulse type noise does exist.

We have made some modifications to the noise limiter circuit used in the 75A-4, serial number 2716 and above, and these modifications are described below. While the modification provides somewhat better operation, the basic problem of noise pulses and selectivity should be kept in mind when deciding what to expect from the noise limiter in the 75A-4 or any receiver having highly selective tuned circuits.

Procedure for modification of receivers below serial number 2716.

1. Move all the shields and ground connections from pin 3 of S3 to pin 1 of S4 as shown in Figure 1.
2. Connect pin 9 of S3 to pin 1 of S4.
3. Add 6.8 K ohm resistor, R118, CPN 745 1387 00, from pin 3 of S3 to pin 1 of S4.
4. Mount tie point, CPN 306 0001 00, on mounting screw of C94 as shown in Figure 2.
5. Move the 100K ohm resistor, R116, and the DA9256 wire on TS-1-1 to TS-4-3.
6. Move the DAS96 wire on TS-3-3 to TS-1-1.
7. Add a 47K ohm resistor, R117, CPN 745 1422 00, between TS-3-3 and TS-1-1.
8. Remove the ground end of C97 from ground and tie it to TS-4-2.
9. Add a 0.1 mf capacitor, C146, CPN 931 0299 00, between TS-1-1 and TS-4-2.
10. Add the DA935 wire from TS-4-2 to pin 3 of S3 on the front panel.
11. Add the 510 mmf capacitor, C147, CPN 912 0545 00, from pin 5 of V12 to ground, TS-2-2.
12. Add the 510 mmf capacitor, C148, CPN 912 0545 00, from pin 2 of V12 to ground, TS-3-2.

Additional parts required: Modification kit 542 0850 00 - Price \$1.69

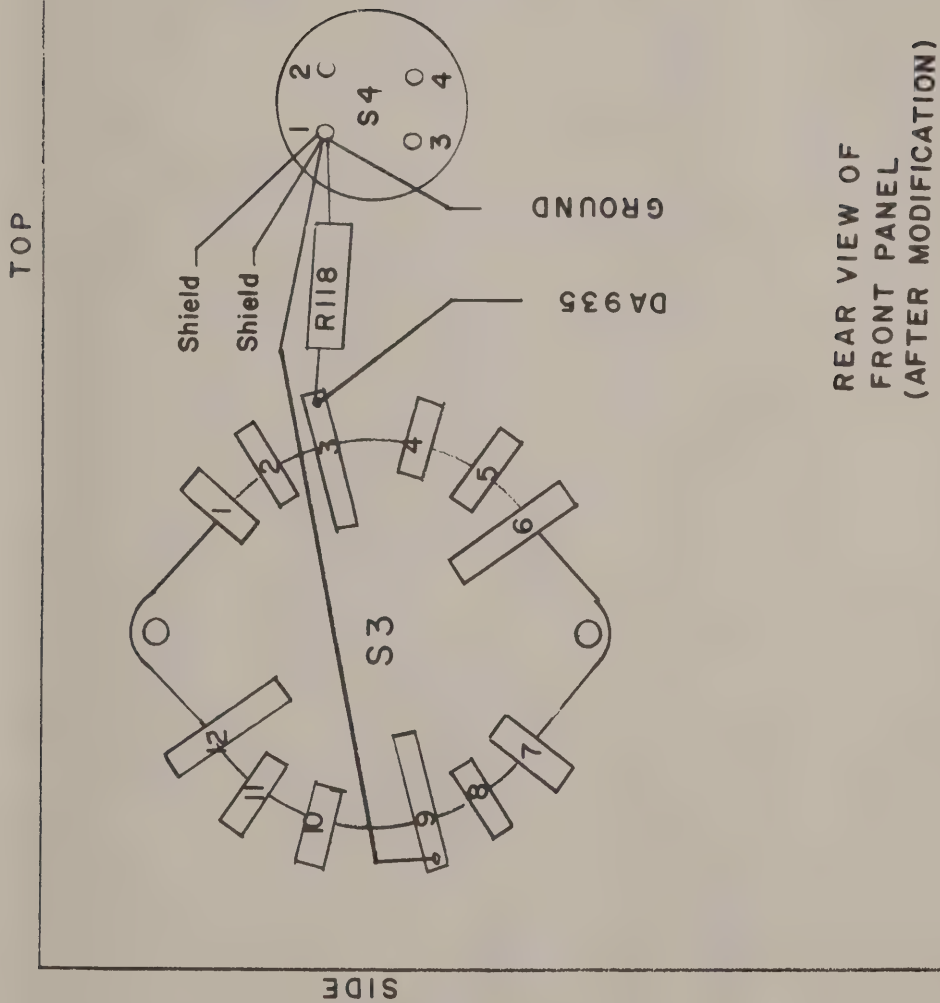
<u>Qty</u>	<u>Description</u>	<u>Circuit Symbol</u>	<u>Collins Part Number</u>
1	Tie point	TS-4	306 0001 00
1	Resistor, 6.8K, $\frac{1}{2}$ watt	R118	745 1387 00
1	Resistor, 47K, $\frac{1}{4}$ watt	R117	745 1422 00
2	Capacitor, 510 mmf	C147, C148	912 0545 00
1	Capacitor, 0.1 mf	C146	931 0299 00

TO OBTAIN PARTS:

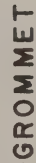
Parts necessary to accomplish the modifications described in this bulletin may be obtained by ordering Modification Kit part number from Collins Radio Company, Service Parts Department, Cedar Rapids, Iowa, after November 30, 1956, at no charge for a period of six (6) months from the date of this bulletin. All orders for these parts kits should make reference to this Service Bulletin.



FIGURE 1



FRONT PANEL







SERVICE BULLETIN

75A-4

3

9-18-57

Page 1 of 1

SUBJECT: ELIMINATION OF RF PICKUP WHILE IN STANDBY POSITION*Might be neci on 6 or 2 meter.*

For most installations the standby circuit in the 75A-4 Amateur Receiver is entirely satisfactory. However, Collins has received a few reports of customers being unable to completely quiet their 75A-4 while transmitting. It has been found that RF getting into the audio stages of the receiver, through accessory equipment wiring, has generally been the cause of this trouble.

While the problem has not been serious enough to warrant a production revision to the receiver design, the following changes and additions are recommended for instances of this difficulty.

1. Remove the bottom panel from the receiver cabinet to expose the under-chassis wiring.
2. Add a 56 uuf capacitor (912 0477 00) from pin 2 of tube socket XV13 to the common ground return for XV13.
3. Add a 56 uuf capacitor (912 0477 00) from pin 7 of tube socket XV13 to the common ground return for XV13.
4. Add a 100 uuf capacitor (912 0495 00) from pin 7 of tube socket XV22 to the common ground return of XV22.
5. Add a .001 ufd capacitor (913 3009 00) from pin 1 of tube socket XV10 to the common ground return for XV10.
6. Add a solder lug (304 0317 00) under the terminal strip mounting screw nearest terminal "M" of terminal strip E3.
7. Remove grounded end of capacitor C141 from E3 terminal G and reconnect to the solder lug of step 6.
8. Add a solder lug (304 0317 00) under the terminal strip mounting screw nearest terminal "500" of terminal strip E4.
9. Add a .01 ufd capacitor (913 3013 00) from the 4 ohm terminal of terminal strip E4 to the solder lug installed in step 8. Do not solder at lug.
10. Add a .01 ufd capacitor (913 3013 00) from the 500 ohm terminal of terminal strip E4 to the solder lug of step 8. Solder.
11. Replace bottom panel of receiver cabinet.

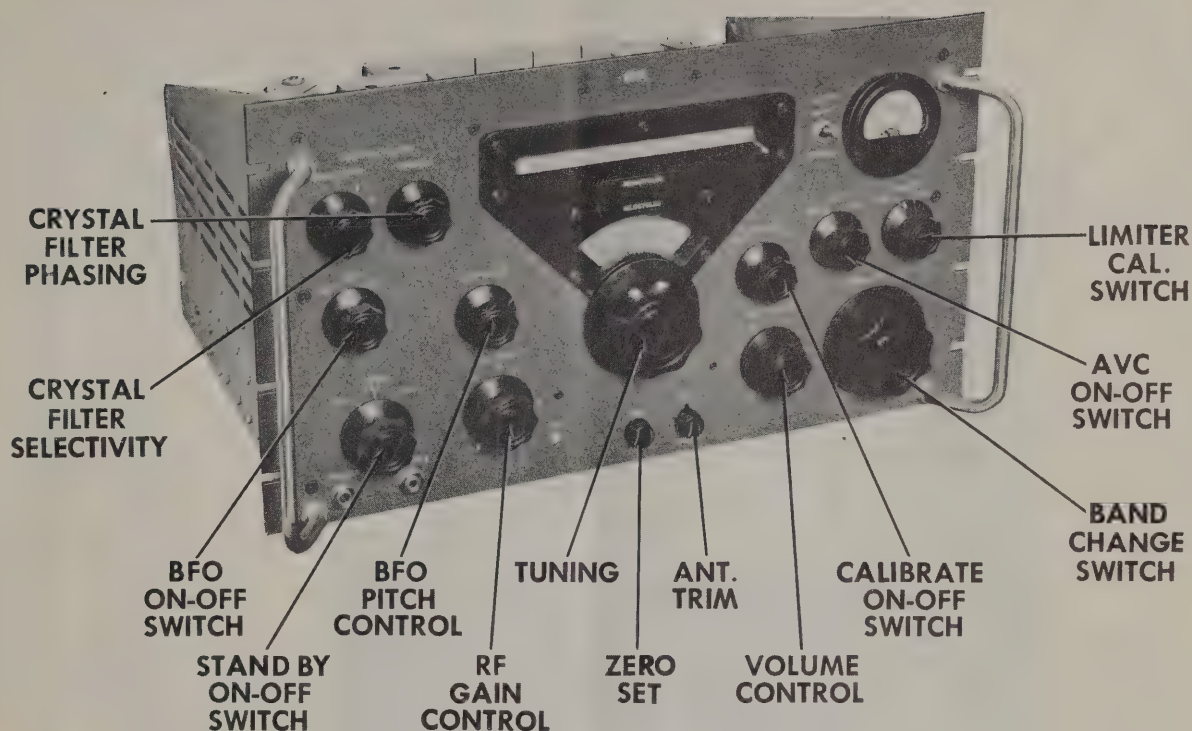
ADDITIONAL PARTS REQUIRED

QTY.	DESCRIPTION	COLLINS PART NUMBER	UNIT PRICE	TOTAL
2	Capacitor: mica, 56 uuf ±10%, 500 wv	912 0477 00	.17	\$.34
1	Capacitor: mica, 100 uuf ±10%, 500 wv	912 0495 00	.17	.17
1	Capacitor, ceramic disc, .001 ufd, +100—20%, 500 wv	913 3009 00	.10	.10
2	Lug, shakeproof solder #4	304 0317 00	.01	.02
2	Capacitor, ceramic disc, .01 ufd, +100—20%, 500 wv	913 3013 00	.42	.84
				\$1.47

All or any portion of the above listed parts may be obtained by ordering from Collins Radio Company, Service Parts Department, Cedar Rapids, Iowa, at the indicated prices and will be available after November 1, 1957. All orders for these parts should specify the quantity, description, and Collins Part Number of the parts desired, and should make reference to this Service Bulletin.



**COLLINS
MODEL 51J-3**



**COLLINS
MODEL 51J-3**

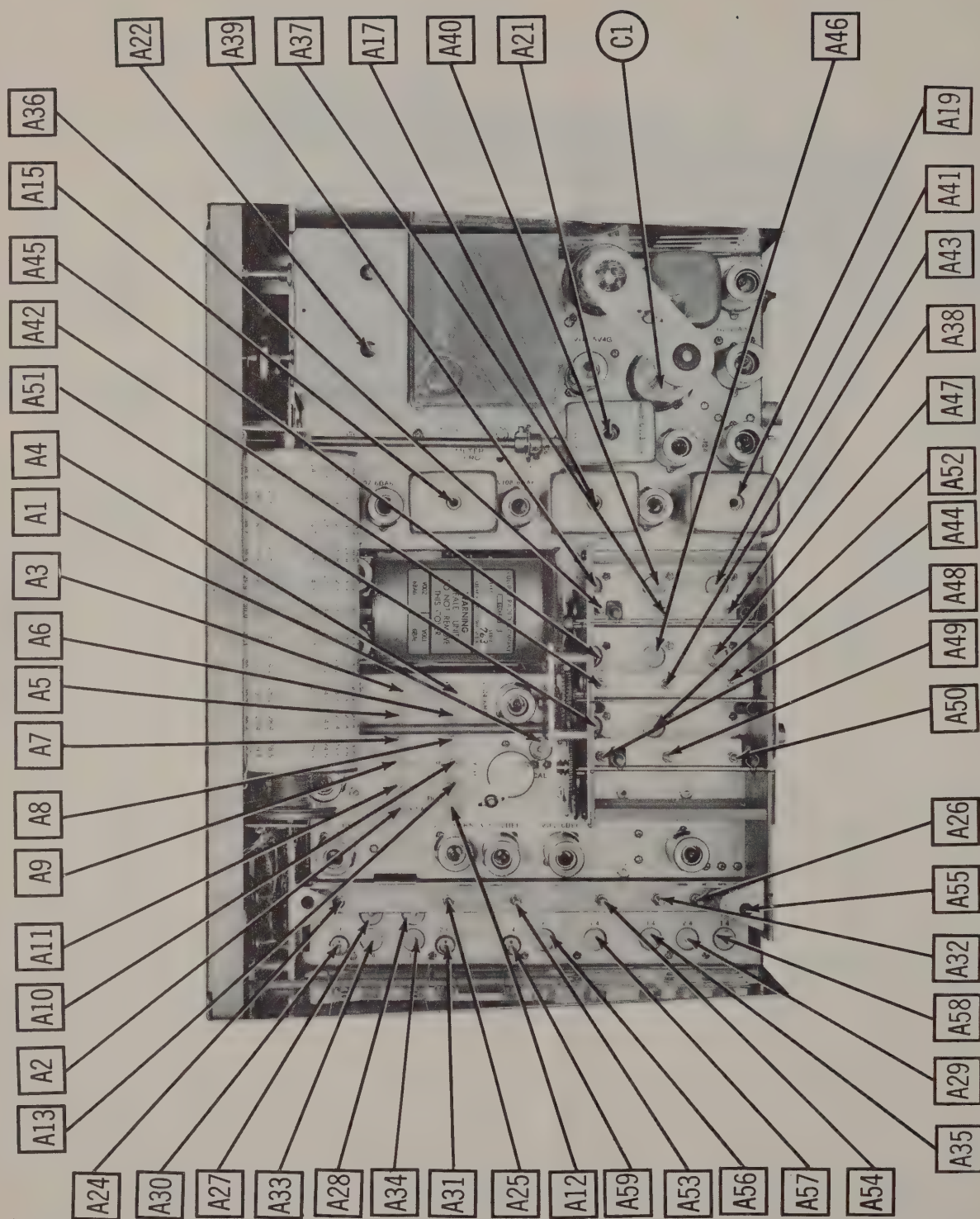
TRADE NAME	Collins Model 51J-3		
MANUFACTURER	Collins Radio Co., Cedar Rapids, Iowa		
TYPE SET	AC Operated Multi-Band AM Superheterodyne Communications Receiver		
TUBES	Eighteen		
POWER SUPPLY	110-120, 220-240 Volts -45/75 Cycles	RATING	.82 Amp. @ 117 Volts AC
TUNING RANGE	500KC-30.5MC		

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed."

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CHASSIS TOP VIEW INDUCTOR AND ALIGNMENT IDENTIFICATION

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Alignment of this equipment should be attempted only by authorized and competent service personnel with proper test facilities. Allow a 15 minute warm-up period for receiver and test equipment.
The following test equipment and alignment tools should be used:
a. 500KC to 30.5MC signal generator
b. DC vacuum tube voltmeter and oscilloscope
c. Two fiber or bakelite aligning tools having diameters of 1/8" and 5/16" and using screwdriver type bits.

100KC OSCILLATOR ALIGNMENT

(Pre-set CAL coarse frequency trimmer at mid-capacity front panel screwdriver adjustment located to left of zero ADJ knob.)
Use a secondary frequency standard and adjust A1 to calibrate the 100KC crystal oscillator.

CRYSTAL OSCILLATOR TRIMMER ALIGNMENT

Set AVC to "on" position and calibrate to "off" position.

Note: The calibration oscillator may be used if a signal generator is not available. Set calibrate to "on" position and follow procedure outlined below. Using the "Kilocycle Knob" tune receiver to each alignment frequency until a peak reading is obtained on the input meter. Make the indicated adjustments but use the "Input meter" on panel to indicate maximum readings.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. 2MMF	High side to pin 1 (grid) of 6AK5 (V1). Low side to chassis.	29.5 MC (Unmod)	30	29.5MC	DC probe thru 470KΩ to pin 7 (grid 3) of 6BE6 (V2). Common to c chassis.	A3	Preset A2 to MINIMUM capacitance. Adjust for maximum deflection if less than 2 volts is obtained at VTVM. If more than 2 volts deflection is obtained re-adjust (detune toward MINIMUM capacitance) until 2 volts deflection is obtained.
2. "	"	27.5MC	28	27.5MC	"	A4	"
3. "	"	25.5MC	26	25.5MC	"	A5	"
4. "	"	23.5MC	24	23.5MC	"	A6	"
5. "	"	21.5MC	22	21.5MC	"	A7	"
6. "	"	19.5MC	20	19.5MC	"	A8	"
7. "	"	17.5MC	18	17.5MC	"	A9	"
8. "	"	15.5MC	16	15.5MC	"	A10	"
9. "	"	13.5MC	14	13.5MC	"	A11	"
10. "	"	1.5MC	1	1.5MC	"	A12	"
11. "	"	"	"	"	DC probe thru 470KΩ to pin 1 (grid 1) of 6BE6 (V4). Common to chassis.	A13	Adjust for maximum deflection.

FIXED 500KC IF AMPLIFIER ALIGNMENT

Connect the signal generator to pin 7 (grid 3) of V5. Connect a clip lead to the cold side of C92 (output of crystal oscillator). Hold other end of clip lead near grid of V5. Set calibrate to "On" position and zero beat signal generator at 500KC. Set calibrate to "Off" position. Set selectivity to "O" position. Attenuate generator output to maintain not more than 3 volts of VTVM.
In step 19 the VFO pitch oscillator is aligned using a signal generator. An alternate method of alignment without a signal generator is as follows:

- Disconnect antenna. Turn calibrate and BFO to "On" positions.
- Tune to a 100KC check point on bands 2 or 3. For example: Tune receiver to 2.0MC.
- If the "BFO Pitch" knob has never been removed from the shaft, rotate the knob until the line on the knob lines up with the line on the panel. If the knob has ever been removed from the shaft adjust A21 to produce a beat note. Turn BFO pitch knob to the right or left of the panel mark until the beat note reaches maximum pitch. The BFO pitch capacitor plates are now either fully closed or open. Loosen set screws on BFO pitch knob and turn knob until white line on knob is 90 degrees from panel mark. Tighten set screws and align mark on knob with mark on panel. The BFO pitch is now at mid-range.
- Tune receiver 10KC off of any 0.1MC point on bands 2 or 3 and advance AUDIO GAIN until a constant pitch beat note is heard. If the constant pitch beat note is not audible adjust A21 until it is. To make sure that this is the correct note turn the kilocycle dial 10KC and note whether the pitch of the note remains constant. This constant pitch beat note (on bands 2 and 3 only) is the result of a fifth harmonic from the 100KC oscillator that leaks into the IF strip and beats with the signal from the BFO. Due to the greater strength of the calibration beat note near a 100KC check point, this constant pitch beat note is most audible about mid-way between check points.
- Adjust A21 for zero beat. The BFO frequency is now 500KC when the mark on the BFO pitch knob coincides with the mark on the panel.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
12. .01MFD	High side to pin 7 (grid 3) of 6BE6 (V5). Low side to chassis.	500KC	Any non-interfering position	Any	DC probe to point  . Common to chassis.	A14	Connect detuning net of .01MFD in series with 4700Ω to pin 5 (plate) of V8 and chassis. Adjust for maximum deflection.
13. "	"	"	"	"	"	A15	Reconnect detuning net to pin 1 (grid) of V9. Adjust for maximum deflection.
14. "	"	"	"	"	"	A16	Reconnect detuning net to pin 5 (plate) of V9. Adjust for maximum deflection.
15. "	"	"	"	"	"	A17	Reconnect detuning net to terminal #4 of L27. Adjust for maximum deflection.
16. "	"	"	"	"	"	A18	Reconnect detuning net to pin 5 (plate) of V10. Adjust for maximum deflection.
17. "	"	"	"	"	"	A19	Reconnect detuning net for terminal #4 of V28. Adjust for maximum deflection.
18. "	"	"	"	"	"	A20	Adjust for maximum deflection.
19.	If the BFO pitch knob has never been removed from the shaft, align the BFO as follows: Turn BFO to "On" position. Set mark on BFO pitch knob to coincide with mark on panel. Adjust A21 for zero beat. If BFO pitch knob has ever been removed from shaft, align BFO as follows: Turn BFO to "On" position. Adjust A21 to produce a beat note. Set BFO pitch knob so that mark on knob coincided with mark on cabinet, then turn knob either to right or left of the panel mark until a point where maximum pitch is obtained. The BFO pitch capacitor are now either fully open or fully closed. Loosen set screws in BFO pitch knob and turn knob on shaft until mark on knob is 90 degrees from panel mark. Tighten set screws. Turn knob so that its mark coincides with mark on panel. Adjust A21 for zero beat.						
20.	To align L25 use scope and FM signal generator having a sweep rate of 4 cycles per second, a frequency excursion of approximately 20KC and a carrier frequency between 1.5 and 3.5MC. Set the mark on the phasing control knob to coincide with mark on panel. Set the phasing capacitor to its mid-range position as follows: Look into right hand hole in top of crystal filter cover (use flash light) in order to see phasing capacitor plates. Rotate phasing control until rotor plates completely mesh with the stator plates. Loosen set screws in phasing control knob and turn knob so that its mark is 90 degrees to the left of the panel mark. Tighten set screws and rotate knob until marks coincide the phasing capacitor is now at its mid-range position. Switch Selectivity to position "I". Turn AVC, Limiter, BFO and Calibrate to "Off" positions.						

ALIGNMENT INSTRUCTIONS

21.	.01MFD	High side to pin 7 (grid 3) of 6BE6 (V5). Low side to chassis.	2.5MC (20KC Swp)	2	See Remarks	Vert. Amp. to point Φ . Low side to chassis.	A22	Turn RF gain to mid-range and synchronize scope. If two symmetrical peaks (each peak is an IF response curve) do not appear on scope, adjust receiver tuning, RF gain and scope controls until they do. Turning phasing control to left should cause re-rejection notch to appear at one side of each peak. If notch does not appear set phasing control approximately 1/8 turn to left of center and adjust A22 until a well defined notch appears on scope pattern. Adjust until no evidence of damped oscillation remains. Turn phasing control approximately 1/8 turn to the right of center. The rejection notch should appear on opposite side of each peak. If the notch is not well defined with no evidence of damped oscillation SLIGHTLY retouch A22. Repeat step 21 until a symmetrical notch with no evidence of damped oscillation appears on both sides of the response curve as outlined above.
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500KC IF PERFORMANCE MEASUREMENTS

SENSITIVITY - An input signal of 25 to 40 microvolts at pin 7 (grid) of V5 should produce 4 volts on VTVM at point Φ

SELECTIVITY

1. Alternate signal generator for 4 volts at point Φ . Use voltage at point Φ and output level of signal generator as reference voltages.
2. Increase signal generator output 6DB (double the voltage). The band width may be determined by noting how far on either side of resonance the generator signal must be detuned to lower the voltage at point Φ to 4 volts.
3. Repeat procedure in step 2 for 60DB increase (1000 times the signal input voltage level).
4. The overall selectivity specifications are:
 - a. Minimum selectivity

6DB	5.5KC Min.	6.5KC Max.
60DB	17.0KC Min.	20.0KC Max.
 - b. Maximum selectivity (crystal filter in)

6DB	0.2KC Min.	0.3KC Max.
60DB	0.2KC Min.	12.0KC Max.

ALIGNMENT OF DIALS WITH VFO

- A. MEGACYCLE DIAL POINTER** - If the dial pointer has been accidentally slipped along the dial cord then reset pointer as follows: Remove the escutcheon plate; turn the kilocycle knob counter clockwise until it reaches the mechanical stop. Then turn it clockwise until the zero-zero mark lines up with the fiducial mark. Turn the kilocycle knob exactly 5 turns clockwise. Slide the megacycle pointer along the dial cord to the center frequency of the band. For example: 2.0MC is the exact center of band 2.
- B. KILOCYCLE DIAL** - If the kilocycle dial reading is incorrect it will be necessary to determine the magnitude and direction of the errors first. To do this, set the receiver on band 2. Set kilocycle fiducial line to the center mark on the escutcheon opening by rotating zero adjustment knob. Set mark on BFO pitch knob to coincide with mark on panel (this sets BFO at 500KC as outlined in step 19). Set calibrate to "On" position. Rotate kilocycle knob to zero beat. Note magnitude and direction of error in kilocycle dial reading. Tune receiver to 2.5MC. Leave BFO pitch knob set at 500KC and rotate kilocycle knob to point of zero beat. Again, note magnitude and the direction of error in the kilocycle dial reading.
1. If kilocycle dial reading is incorrect by less than 3KC in the same direction by equal amount at both ends of the megacycle dial correct as follows:
 - a. Make certain BFO pitch knob is set at 500KC.
 - b. Tune the receiver for zero beat at the 100KC check point nearest the dial setting for which maximum accuracy is desired. For example: If maximum accuracy is desired at 1.83MC, tune for zero beat at 1.8MC by rotating the kilocycle knob.
 - c. Set kilocycle fiducial line to zero-zero on kilocycle dial by rotating zero adjustment knob.
 2. If the kilocycle dial reading is incorrect by more than 3KC in the same direction by an equal amount at both ends of the megacycle dial, correct as follows:
 - a. Check to see that BFO pitch knob is set at 500KC.
 - b. Tune to zero beat at 1.5MC.
 - c. Set kilocycle fiducial line to middle index mark on escutcheon opening by rotating zero adjustment knob.
 - d. Loosen the set screws in circular kilocycle dial and set to zero-zero. Tighten set screws.
 3. If the two errors in kilocycle dial reading are either opposite in direction or vary in size, it indicates that the VFO end points have shifted. Correct as follows:
 - a. Check to see that BFO pitch knob is set at 500KC then tune receiver to zero beat at 1.5MC on band 2.
 - b. If the zero mark on kilocycle dial lies within the lines on escutcheon opening, set kilocycle fiducial line to zero-zero on the kilocycle dial by rotating the zero adjustment knob.
 - c. If the zero-zero mark falls outside the lines on the escutcheon opening, loosen set screws in the kilocycle dial. Set fiducial mark to the center line in the escutcheon opening. Turn kilocycle dial until zero-zero mark coincides with the fiducial. Tighten set screws.
 - d. Turn kilocycle knob approximately 10 turns counter clockwise to zero beat. This procedure should tune the receiver to 2.5MC.
 - e. At this point note the error in the kilocycle dial reading.
 - f. If this error is less than ± 3 KC, set the fiducial to 2.5MC by rotating the zero adjustment knob. This establishes the point of maximum accuracy at 2.5MC. If maximum accuracy is desired at some other point in the band, the receiver may be tuned to zero beat at the desired check point. Then adjust fiducial to zero-zero on the kilocycle dial.
 - g. If the error is more than ± 3 KC refer to VFO alignment.
 - C. VFO FREQUENCY CHECK** - The VFO frequency should be checked against a known source to determine if the VFO shaft has been displaced a full turn, thereby shifting the VFO frequency exactly 100KC. Use a signal generator having an accuracy of $\pm 1\%$ or ± 20 KC or another 51J-3 receiver known to be properly aligned, and check as follows:
 1. Set BFO pitch knob at 500KC and turn calibrate to "Off" position.
 2. If signal generator is used, connect high side to pin 7 (grid 3) of 6BE6 (V5). Low side to chassis. Set generator to 2.0MC. Tune receiver for zero beat at 2.0MC. If the VFO shaft is displaced a full turn, zero beat should occur within 20KC of 1.9MC or 2.1MC instead of 2.0MC.
 3. If an accurately aligned 51J-3 test receiver is used couple the antenna jack of the test receiver to the output of the VFO to be checked. Set BFO pitch of test receiver at 500KC. Switch calibrate to "On" position in test receiver. Tune the receiver containing VFO to be checked to 2.0MC. Tune test receiver to zero beat at 2.5MC. If the shaft of the VFO being checked is displaced a full turn, zero beat should occur at 2.4MC or 2.6MC instead of 2.5MC.
 4. If steps 2 or 3 indicate that the VFO shaft has been displaced a full turn, correct as follows:
 - a. Connect a clip lead from pin 7 (grid 3) of 6BE6 (V5) to the cold side of C92 (100KC oscillator output). Turn calibrate to "On" position. Set BFO pitch at 500KC and tune receiver to zero beat at 2.5MC. Loosen set screws in VFO coupler.
 - b. If zero beat occurred at 2.1MC instead of at 2.0MC in step 2 or at 2.4MC instead of at 2.5MC in step 3 the VFO frequency is 100KC lower than it should be. Correction can be made by turning VFO shaft one full turn counter clockwise to zero beat.
 - c. If zero beat occurred at 1.9MC in step 2 or at 2.6MC in step 3 the VFO frequency is 100 KC higher than it should be. Correction can be made by turning VFO shaft one full turn clockwise to zero beat.
 - d. Tighten set screws in VFO shaft coupler.

VARIABLE IF ALIGNMENT

Attenuate signal generator output to maintain less than 5 volts on VTVM at point Φ

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
22.	47 Ω Resistor in series with 100MMF capacitor	High side thru dummy to antenna receptacle. Low side to chassis.	1.6MC (Unmod)	2	1.6MC	DC probe to point Φ . Common to chassis.	A24, A25 A26	Set A23 (Ant. trim.) to its mid-range position. Turn BFO to "On" position and adjust generator to zero beat at 1.6MC. Turn BFO to "Off" position. Adjust A24, A25 and A26 for maximum deflection.
23.	"	"	2.4MC	"	2.4MC	"	A27, A28 A29	Turn BFO to "On" position and adjust generator to zero beat at 2.4MC. Turn BFO to "Off" position. Adjust A27, A28 and A29 for maximum deflection. Repeat steps 22 and 23 until maximum deflection is obtained on VTVM.

ALIGNMENT INSTRUCTIONS (cont)

RF ALIGNMENT BAND 3

Attenuate signal generator output to maintain less than 5 volts on VTVM at point Δ .

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
24. 47 Ω Resistor in series with 100MMF capacitor	High side thru dummy to antenna receptacle. Low side to chassis.	2.6MC	3	2.6MC	DC probe to point Δ . Common to chassis.	A30 A31 A32	Turn BFO to "on" position and adjust generator to zero beat at 2.6MC. Turn BFO to "off" position. Adjust for maximum deflection.
25. "	"	3.4MC	"	3.4MC	"	A33 A34 A35	Turn BFO to "on" position and adjust generator to zero beat at 3.4MC. Turn BFO to "Off" position. Adjust for maximum deflection. Repeat steps 24 and 25 until maximum deflection is obtained on VTVM.

RF ALIGNMENT BANDS 4-7

Attenuate signal generator output to maintain less than 5 volts on VTVM at point Δ .

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
26. 47 Ω Resistor in series with 100MMF capacitor	High side thru dummy to antenna receptacle. Low side to chassis.	4.0MC (Unmod)	4	4.0MC	DC probe to point Δ . Common to chassis.	A36 A37 A38	Turn BFO to "on" position and adjust generator to zero beat at 4.0MC. Turn BFO to "off" position. Adjust for maximum deflection.
27. "	"	7.0MC (Unmod)	7	7.0MC	"	A39 A40 A41	Turn BFO to "on" position and adjust generator to zero beat at 7.0MC. Turn BFO to "off" position. Adjust for maximum deflection. Repeat steps 26 and 27 until maximum deflection is obtained on VTVM.

RF ALIGNMENT BANDS 8-15

Attenuate signal generator output to maintain less than 5 volts on VTVM at point Δ .

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
28. 47 Ω Resistor in series with 100MMF capacitor	High side thru dummy to antenna receptacle. Low side to chassis.	8.0MC	8	8.0MC	DC probe to point Δ . Common to chassis.	A42 A43 A44	Turn BFO to "on" position and adjust generator to zero beat at 8.0MC. Turn BFO to "off" position. Adjust for maximum deflection.
29. "	"	15.0MC	15	15.0MC	"	A45 A46 A47	Turn BFO to "on" position and adjust generator to zero beat at 15MC. Turn BFO to "off" position. Adjust for maximum deflection. Repeat steps 28 and 29 until maximum deflection is obtained on VTVM.

RF ALIGNMENT BANDS 16-30

Attenuate signal generator output to maintain less than 5 volts on VTVM at point Δ .

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
30. 47 Ω Resistor in series with 100MMF Capacitor	High side thru dummy to antenna receptacle. Low side to chassis.	16.0MC	16	16.0MC	DC probe to point Δ . Common to chassis.	A48 A49 A50	Turn BFO to "on" position and adjust signal generator to zero beat at 16.0MC. Turn BFO to "off" position. Adjust for maximum deflection.
31. "	"	30.0MC	30	30.0MC	"	A51 A52	Turn BFO to "on" position and adjust signal generator to zero beat at 30.0MC. Turn BFO to "off" position. Adjust for maximum deflection. Repeat steps 30 and 31 until maximum deflection is obtained on VTVM.

RF ALIGNMENT BAND 1

Attenuate signal generator output to maintain less than 5 volts on VTVM at point Δ .

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
32. 47 Ω Resistor in series with 100MMF capacitor	High side thru dummy to antenna receptacle. Low side to chassis.	0.6MC	1	0.6MC	DC probe to point Δ . Common to chassis.	A53 A54 A55 A56	Turn BFO to "on" position and adjust generator to zero beat at 0.6MC. Turn BFO to "off" position. Adjust A53 so that core is in approximately same position as A24 and A25. Adjust A54, A55 and A56 for maximum deflection. Two peaks may be found when adjusting A56. The correct peak will occur at a greater capacitance value. Adjust in a counter clockwise direction to increase capacitance.
33. "	"	1.4MC	"	1.4MC	"	A57 A58 A59	Turn BFO to "on" position and adjust generator to zero beat at 1.4MC. Turn BFO to "off" position. Adjust for maximum deflection. Repeat steps 32 and 33 until maximum deflection is obtained at VTVM.

VFO ALIGNMENT (GENERAL)

If the VFO unit becomes sufficiently misaligned as indicated by the procedure outlined under "Alignment of Dials With VFO", paragraph B3, the unit should be returned to the factory for permanent alignment. Temporary alignment may be attempted by a qualified technician only in case of emergency.

CAUTION: Do not, under any circumstances, remove the outer cylindrical cover. To do so will break the hermetic seal and expose the frequency corrector mechanism and the carefully compensated frequency-determining elements.

If the VFO is to be returned to the factory see instructions under "Complete VFO Removal".

ALIGNMENT INSTRUCTIONS (cont)

VFO ALIGNMENT PROCEDURE

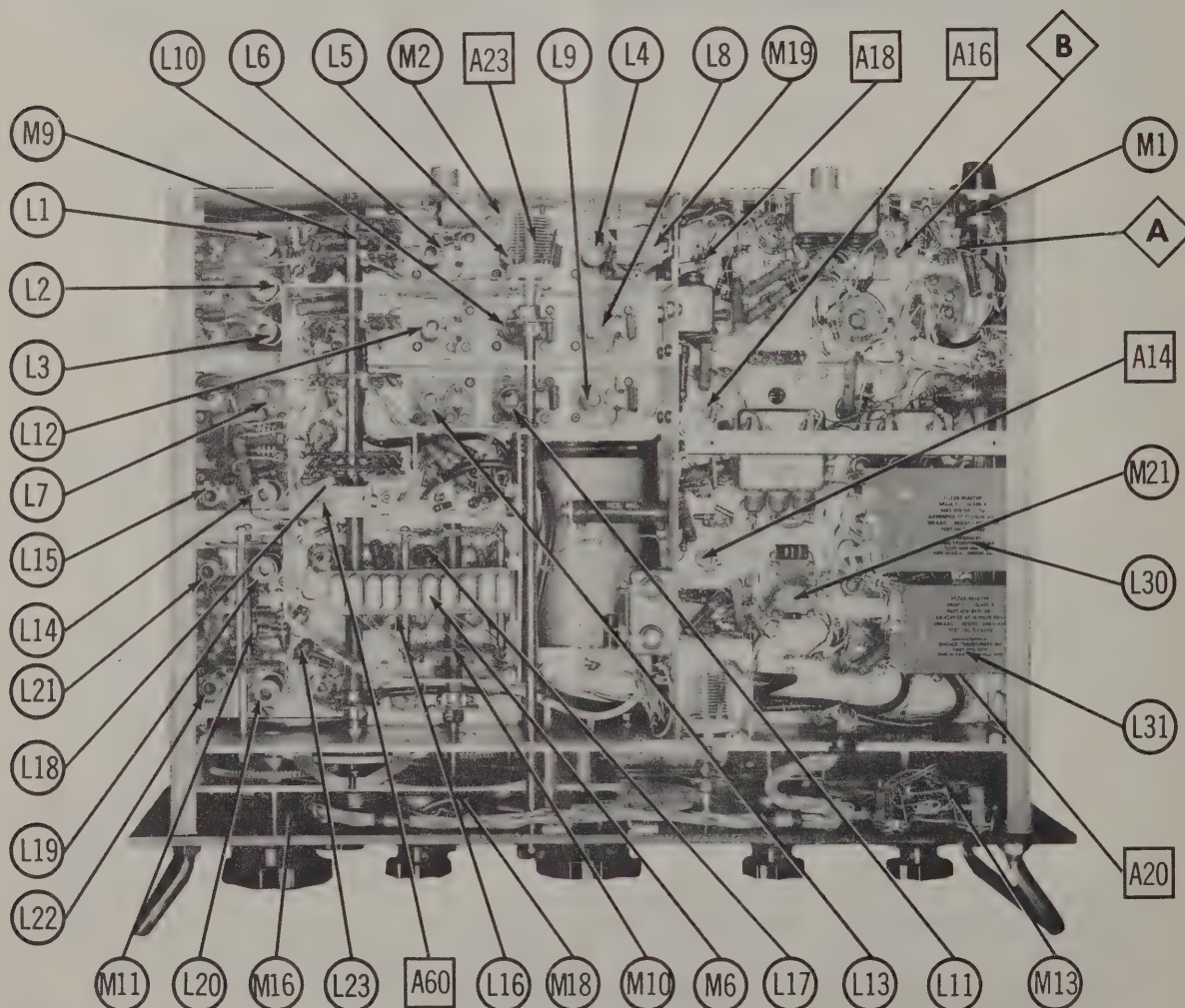
1. Set the BFO pitch line so that the white lines coincide (when lines coincide, BFO is set at 500KC). Turn calibrate to "Off" position.
2. A signal generator with an accuracy of $\pm 20\text{KC}$ at 1.5MC should be used.
3. Loosen set screws in VFO coupler and slide coupler hubs apart. Remove front panel of receiver and VFO mounting screws. Pull out the VFO and allow it to hang on the connecting wires. Fabricate a small circular dial having a linear scale from 0 to 100 completely around its outer edge. Mount the dial on the VFO shaft. Attach a small wire (use as pointer) to one of the VFO mounting screws. Let one division on the dial equal one kilocycle.
4. Turn the set on and short antenna terminal to chassis. Since none of receivers tuned circuits are used in this alignment it will not be necessary to set the receiver dials.
5. Couple the signal generators 1.5MC output to pin 1 (grid 1) of 6BE6 (V5).
6. Locate the low frequency end point (2.0MC) of the VFO by rotating the VFO shaft clockwise to the last zero beat obtainable in that direction. (Do not try to force VFO shaft after it reaches the stop at either end of its range.)
7. The VFO is now within 20KC of its 2.0MC setting. To adjust more accurately, remove the signal generator and connect a clip lead from the cold side of C92 (100KC oscillator output) to pin 1 (grid 1) of 6BE6 (V5). Turn calibrate to "On" position. Carefully turn VFO shaft to the nearest zero beat. The VFO is now set to exactly 2.0MC. Place the VFO dial pointer at zero using care to retain the zero beat setting.
8. Turn the VFO shaft exactly 10 turns counter clockwise. Locate zero beat by turning the VFO shaft a few divisions toward either side of the 10-turn mark.
9. Should zero beat occur on either side of the 10-turn mark, note the amount and direction of error by counting divisions between zero and pointer. Multiply the number of error divisions by 1.5.
10. Should zero beat occur at less than 10 turns, turn the VFO shaft counter clockwise by the number of divisions arrived at in step 9.
11. Should zero beat occur at more than 10 turns, turn the VFO shaft clockwise by the number of divisions arrived at in step 9.
12. Remove the hex plug from the front of oscillator. With the VFO adjustment tool (supplied with equipment) loosen the lock nut which becomes visible when hex plug is removed. Insert the screwdriver end of the adjustment tool into outer portion. Adjust trimmer screw until zero beat is again obtained. Tighten lock nut using care to retain zero beat.
13. The 2.0 and 3.0MC zero beat positions should now be exactly 10 turns apart. If this is not so, repeat the above procedure until they are. It will be necessary to turn dial pointer at initial zero beat position each time this procedure is repeated. Tighten lock-nut after each trimmer adjustment.
14. After the 2 and 3MC endpoints of the VFO have been separated by exactly 10 turns, replace the hex plug, put the VFO in the receiver and replace the front panel. Align the receiver dials with the VFO as outlined in paragraph B2 in "Alignment of Dials With VFO".

4MC BAND SUPPRESSION COIL ADJUSTMENT

Turn BFO to "On" position and tune in spurious signal at 1250KC. Adjust A60 for maximum attenuation of spurious signal.

COMPLETE VFO REMOVAL

- A. Remove front panel and let it swing forward on the wires.
- B. Loosen set screws in flexible coupler. Pull coupler apart and remove center disc.
- C. Identify the VFO connecting wire so they may be reconnected correctly. Unsolder wires.
- D. Remove the three retaining screws that hold VFO to chassis.
- E. Slip the VFO back and tip the rear downward.
- F. The VFO may now be pulled from the receiver.



CHASSIS BOTTOM VIEW-INDUCTOR & ALIGN. IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		NOTES
		COLLINS PART No.	STANDARD REPLACEMENT	
V1	RF Amplifier	6AK5	6AK5	
V2	1st. Mixer	6BE6	7BD	
V3	HF Crystal Osc.	6AK5	7CH	
V4	Band 1 Mixer	6BE6	7BD	
V5	Band 2 Mixer	6BE6	7CH	
V6	Oscillator	6BA6	7BK	
V7	Buffer	6BA6	7BK	
V8	1st. IF Amplifier	6BA6	7BK	
V9	2nd. IF Amplifier	6BA6	7BK	
V10	3rd. IF Amplifier	6BA6	7BK	
V11	Detector -	12AX7	12AX7	
V12	AVC Rectifier	6BA6	7BK	
V13	AVC Amplifier -	12AU7	12AU7	
V14	Limiting	12AX7	12AX7	
V15	AF Amplifier	6AQ5	6AQ5	
V16	Calibration Osc.	6BA6	6BA6	
V17	Rectifier	5V4G	5V4G	
V18	Voltage Regulator	0A2	0A2	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP. VOLT	REPLACEMENT DATA				NOTES
		COLLINS PART No.	CENTRALAB PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1A	35	184500000			PE2764	Note 1
C2	35	184650900		BS45	RI491	Note 1
C3	20	184650900		BS45	RI491	
C4	8	184651500			RI490	
C5	100	184605900		NT-531	5TCU-T1	
C6	51	184629400	TCN-100			
C7	35	184644800	TCN-51			
C8	22	184642400	TCZ-36			
C9	10	184640600	TCZ-22			
C10	5	184643850	TCZ-10			
C11	100	184640500	TCZ-4.7			
C12	24	184642800	TCN-101			
C13	800					
C14	390					
C15	220					
C16	30					
C17	20					
C18	100					
C19	10000					
C20	10000					
C21	1					
C22	2					
C23	910					
C24	5					
C25	200					
C26	200					
C27	62					
C28	62					
C29	10000					
C30	10000					
C31	10000					
C32	10000					
C33	10000					
C34	20					
C35	100					
C36	10000					
C37	15					
C38	100					
C39	200					

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP. VOLT	REPLACEMENT DATA				NOTES
		COLLINS PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	
C40	68	916430900	SI69NP0	TCZ-68	TZ28	
C41	47	916446300	SI47NP0	TCZ-47	TZ22	
C42	36	916444800	SI47NP0	TCZ-36	TZ19	
C43	15	916441200	SI15NP0	TCZ-15	TZ11	
C44	150	912050600	1469-00015	D6-103	22R5T15	
C45	10000	913056600	SI10000	D6-103	TP67	
C46	100	912049400	1469-0001	D6-103	22R5T1	
C47	10000	913056600	SI10000	D6-103	TP67	
C48	10000	913056600	SI10000	D6-103	TP67	
C49	150	912050600	1469-00015	D6-103	5R5T15	
C50	10000	913056600	SI10000	D6-103	TP67	
C51	180	912051100				
C52	300	912052600				
C53	4	916438000				
C54	2	916437300	SI2NP0	TCZ-2	Z005	
C55	180	912051100				
C56	300	912052600				
C57	100	912049400	1469-0001		22R5T1	
C58	220	912051700				
C59	10000	913056600	SI10000	D6-103	TP67	
C60	10000	913056600	SI10000	D6-103	TP67	
C61	10000	913056600	SI10000	D6-103	TP67	
C62	10000	913056600	SI10000	D6-103	TP67	
C63	10000	913056600	SI10000	D6-103	TP67	
C64	10000	913056600	SI10000	D6-103	TP67	
C65	2	916437300	SI2NP0	TCZ-2	Z005	
C66	10000	913056600	SI10000	D6-103	TP67	
C67	10000	913056600	SI10000	D6-103	TP67	
C68	10000	913056600	SI10000	D6-103	TP67	
C69	2	916437300	SI2NP0	TCZ-2	Z005	
C70	10000	913056600	SI10000	D6-103	TP67	
C71	10000	913056600	SI10000	D6-103	TP67	
C72	10000	913056600	SI10000	D6-103	TP67	
C73A	.1	961516900	630/.1-.1		DYR6011	
C74	.1	916437300	SI2NP0	TCZ-2	Z005	
C75	330	912052900				
C76	100	912049400	1469-0001		22R5T1	
C77	100	912049400	1469-0001		22R5T1	
C78	7					
C79	10000	913056600	SI10000	D6-103	TP67	
C80	10000	913056600	SI10000	D6-103	TP67	
C81A	.1	961516700	630/.1-.1		DYR611	
C82	.1	913056600	SI10000	D6-103	TP67	
C83	10000	913056600	SI10000	D6-103	TP67	
C84	10000	913056600	SI10000	D6-103	TP67	
C85	10000	913056600	SI10000	D6-103	TP67	
C86	10000	913056600	SI10000	D6-103	TP67	
C87	10000	913056600	SI10000	D6-103	TP67	
C88	8800	935211000				
C89	100	912049400	1469-0001		22R5T1	
C90	10000	913056600	SI10000	D6-103	TP67	
C91	10000	913056600	SI10000	D6-103	TP67	
C92	10	916440600	SI10NP0	TCZ-10	TZ09	
C93	2	916437300			22R5V2	
C94A	.1	961417500	630/.1-.1		DYR6011	
C95	10000	913056600	SI10000	D6-103	TP67	

Note 1. CIA positive is terminal 3. CUB positive is terminal 5. Terminal 1 is common negative.

Note 2. Some models use 430MMF in this application (part #920540400).

Note 3. Some models use 430MMF in this application (part #920536000).

Note 4. Some models use 220MMF in this application (part #920517000).

Note 5. Some models use 75MMF in this application (part #920485000).

Note 6. Some models use 5MMF in this application (part #920428000).

COLLINS
MODEL 51A-3

PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING				REPLACEMENT DATA		INSTALLATION NOTES	
	RESISTANCE	WATTS	COLLINS PART No.	CLAROSTAT PART No.	MALORY PART No.			
R1A	10KΩ	2	380011800	A43-10K	R10, 000L	RF Gain		
R2	500KΩ	2	380011900	Not Req.	U-48	Attach to R1A		
R3A	100Ω	2	380012000	W100	R100L	Audio Gain		
B	Shift		Not Req.	Not Req.	Not Req.	"S" Meter Zero Adjust		
						Attach to R3A		

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA				NOTES
	PRI.	SEC.	Collins Part No.	Stancor Part No.	Merit Part No.	Thordarson Part No.	
T2	5KΩ	600Ω Tap @ 4Ω	677043000				

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	Collins Part No.	Weissner Part No.	Merit Part No.	Miller Part No.	
L1	Ant. Coil	2.7Ω		5043056001				Band 1 (.5-1.5MC)
L2	Ant. Coil	.6Ω		5052147002				Band 2 (1.5-2.5 MC)
L3	Ant. Coil	.5Ω		5052149002				Bands 3 (2.5-3.5 MC)
L4	Ant. Coil	.4Ω		5043060001				Bands 4-7 (3.5-7.5 MC)
L5	Ant. Coil	.2Ω		5043061001				Bands 8-15 (7.5-15.5MC)
L6	Ant. Coil	.1Ω		5043062001				Bands 16-30 (15.5-30.5MC)
L7	Mixer Coil	2.4Ω		5043056001				Band 1 (.5-1.5MC)
L8	Mixer Coil	.2Ω		5043060001				Bands 4-7 (3.5-7.5MC)
L9	Mixer Coil	.7Ω		5043060001				Bands 4-7
L10	Mixer Coil	0Ω		5043061001				Bands 8-15 (7.5-15.5MC)
L11	Mixer Coil	0Ω		5043061001				Bands 8-15
L12	Mixer Coil	.1Ω		5043062001				Bands 16-30 (15.5-30.5MC)
L13	Secondary	.2Ω		5043062001				Bands 16-30
L14	IF Coil	.5Ω		5043064001				Band 1 (10.5-11.5MC)
L15	IF Coil	.2Ω		5043057001				
L16	Injection							
L17	Osc. Cathode	9.5Ω		5084535001				Tapped @ .1Ω
L18	Injection	.3Ω		5043074002				
L19	Osc. Harmonic							
L20	4MC Band	.4Ω		5046646002				
L21	Variable IF	.5Ω		5043064001				
L22	Variable IF	.5Ω		5045347001				
L23	Variable IF	.9Ω		5043066001				
L24	RF Choke	.8Ω		5043066001				
L25	1st. IF Trans.	5Ω		240007300				
L26	2nd. IF Trans.	5Ω		278009300				
L27	3rd. IF Trans.	2.2Ω		278009000				
L28	4th. IF Trans.	2.2Ω		278009000				
L29	5th. IF Trans.	2.2Ω		278009000				
L30	BFO Coil	2.3Ω		278009300				

FILTER CHOKE

ITEM No.	RATINGS		REPLACEMENT DATA				NOTES
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	Collins Part No.	Stancor Part No.	Merit Part No.	Thordarson Part No.	
L30	.120A	100Ω (Max)	678043200				
L31	.080A	300Ω (Max)	678043100				

RESISTORS

ITEM No.	RATING	REPLACEMENT DATA		ITEM No.	RATING	REPLACEMENT DATA		NOTES
		OHMS	WATT			OHMS	WATT	
R4	1Meg	745121200		R41	180Ω 5%	745103300		
R5	100KΩ	745110000		R42	180Ω	745103300		
R6	33KΩ	745114900		R43	27KΩ	745114600		
R7	680Ω	745121000		R44	120Ω 5%	747003200		
R8	10KΩ	74512800		R45	310Ω 5%	747003600		
R9	30KΩ	745119000		R46	120Ω 5%	747003200		
R10	470Ω	745107200		R47	100KΩ	745117000		
R11	47KΩ	745135600		R48	470KΩ	745119800		
R12	2200Ω	745110000		R49	120KΩ	745117400		
R13	100KΩ	745114900		R50	100KΩ	745117000		
R14	33KΩ	745115600		R51	220Ω	745110000		
R15	2200Ω	745110000		R52	33KΩ	745114900		
R16	47KΩ	745115600		R53	220Ω	745110000		
R17	100KΩ	745117000		R54	220KΩ	745118400		
R18	470Ω	745107200		R55	100KΩ	745117000		
R19	33KΩ	745114900		R56	100Ω	745108600		
R20	470KΩ	745119800		R57	220Ω	745110000		
R21	100KΩ	745117000		R58	820Ω	745103300		
R22	470Ω	745107200		R59	47KΩ	745115600		
R23	33KΩ	745114900		R60	100KΩ	745111000		
R24	2200Ω	745110000		R61	68KΩ	745116300		
R25	220Ω	745115600		R62	33KΩ	745113900		
R26	470KΩ	745119800		R63	470KΩ	745119800		
R27	10KΩ	745112800		R64	470KΩ	745119800		
R28	27KΩ	745118400		R65	330Ω	745110700		
R29	47KΩ	745115600		R66	220KΩ	745118400		
R30	220KΩ	745110000		R67	100KΩ	745117000		
R31	220KΩ	745118400		R68	680KΩ	745120500		
R32	220KΩ	745110000		R69	4700Ω	745114000		
R33	10KΩ	74512800		R70	100KΩ	745117000		
R34	27KΩ	745114600		R71	10KΩ	745112800		
R35	47KΩ	745115600		R72	220KΩ	745118400		
R36	2200Ω	745110000		R73	1000Ω	745508600		
R37	10KΩ	74512800		R74	4000Ω 5%	747104600		
R38	47KΩ	745115600		R75	10Ω	747104600		
R39	2200Ω	745110000		R76	220Ω	745100200		
R40	100Ω	745104400						

Note 1: Some models may use a 2200Ω resistor in this application.
Note 2: Not used in all models.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA		NOTES
	PRI #1	SEC. 1	SEC. 2	SEC. 3	Collins Part No.	Thordarson Part No.	
T1	J17VAC 700VCT	5VAC @ 2A	6.3VAC @ 5A		672042900 *		
	PRI #2 080A (RMS)						
	@ .82A						

* Connect two primary windings in series for 220-240 volt operation.

PARTS LIST AND DESCRIPTIONS (Continued)

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA			
			COLLINS PART No.		LITTELFUSE PART No.	
			FUSE	HOLDER	FUSE	HOLDER
M1	3AG S/B	1 1/2 A 125V	264000700	265100300	31301.5 (3AG S/B-1.5A)	342001
					MDL 1 1/2	HKP

MISCELLANEOUS

ITEM No.	PART NAME	COLLINS PART No.	NOTES
M2	Lamp	262023800	NE-48 static discharge
M3	Dial light	262324000	#47 (3 used)
M4	Tuning unit	5050410003	Hermetically sealed VFO
M5	Filter unit		Crystal
M6A	Crystal	291823400	Bands 29-30 - 10666.67KC
B	Crystal	291810200	Bands 23-24 - 13000.00KC
C	Crystal	291811400	Bands 19-20 - 11000.00KC
D	Crystal	291806300	Bands 15-16 - 9000.00KC
E	Crystal	291813500	Bands 11-12, 25-26 - 14000.00KC
F	Crystal	291817000	Bands 9-10, 21-22 - 12000.00KC
G	Crystal	291813300	Bands 7-8, 17-18, 27-28 - 10000.00KC
H	Crystal	291813300	Bands 5-6, 13-14 - 8000.00KC
K	Crystal	291813300	Band 3 - 6000.00KC
M	Crystal	291813300	Band 1 - 4000.00KC
M7	Crystal	291595400	Calibration (special 100KC unit)
M8	Crystal	291517500	Filter (500KC) part of M5 unit
M9A	Crystal	269127000	Water-antenna coil selector
B	Bandswitch	269127000	Water-antenna trimmer selector
C		269127300	Water-RF coil selector
D		269127300	Water-RF amp. plate coil selector
E		269127300	Water-mixer grid coil selector
F		269127000	Water-mixer plate circuit selector
G	Bandswitch	269127000	Water-mixer plate circuit selector
M10A		269127200	Water-11/2 osc-harmonic selector
B		269127000	Water-crystal selector
M11A		269127000	Water-variable IF selector
B		269127000	Water-variable IF selector
M12	Switch	259038000	BFO On-Off
M13	Switch	259038000	On-Standby-Off
M14	Switch	259037800	Selectivity (part of M5 filter unit)
M15	Switch	259038000	AVC On-Off
M16	Switch	259038000	Limiter In-Out
M17	Switch	266306200	Meter Input-Output
M18	Switch	259038000	Calibrate On-Off
M19	Relay	972117600	Break-In, contact rating 3 Amp. 150watt, 12V. . 021A direct current
M20	Meter	476901700	Audio level, 0-1MA 48 ohms $\pm 10\%$
M21	Rectifier	353330000	Dry disc. instrument type
	Trimmer cap	922015300	Variable air-ant. and cal. osc. adj. (7-100MMMF)
	Trimmer cap	922007900	Variable air-crystal filter phasing (3.5-27MMMF)
	Trimmer cap	917103800	Variable ceramic (8-50MMMF) 19 used
	Trimmer cap	917103600	Variable ceramic (5-25MMMF) 10 used
	Trimmer cap	917103500	Variable ceramic (3-12MMMF) osc. grid circuit
	Drum	5043097	Band Indicating

DIAL CORD STRINGING INSTRUCTIONS

MEGACYCLE POINTER CORD

Refer to figure on following page. Remove the front panel. If the cord is to be replaced, use 36-5/8 inches of nylon-covered cord.

- (a) Turn KILOCYCLE shaft counter clockwise to stop.
- (b) Tie a loop in the cord. Loop the cord over the tab at point X.
- (c) Wind cord about one-half turn clockwise on pulley A, continue to pulley B, pointer, pulley C, and back to pulley A.
- (d) Wind cord about 1-1/2 turns clockwise around pulley A. Fasten cord to the spring on pulley A. Fasten cord to the spring on pulley A with spring at full tension.
- (e) Replace front panel, KILOCYCLE shaft flat washer, tension washer and collar, and knobs.

DRUM CORD

If the drum cord has jumped the pulleys, restraining it without removing the front panel. If the cord is broken, remove the front panel. Use 27 inches of nylon-covered cord for replacement.

- (a) Turn BAND CHANGE knob to band 30.
- (b) Turn pulley E about one-half turn and hold tension of spring.
- (c) Insert cord in pulley D and knot it. Wind cord about three-fourths of a turn on pulley D; extend to pulley E, and wind it 1-1/2 turns or more around pulley E as needed. Insert cord in hole and knot it.
- (d) Replace panel and knobs.
- (e) Loosen set screw in drum hub and turn drum until 30MC band is centered in the escutcheon opening; then tighten set screw.

RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AK5	1.2Meg	0Ω	0Ω	.1Ω	†18KΩ	†34KΩ	0Ω		
V 2	6BE6	2.5Ω	470Ω	0Ω	.1Ω	†3.6KΩ	†48KΩ	330KΩ		
V 3	6AK5	100KΩ	9.5Ω	0Ω	.1Ω	†50KΩ	†37KΩ	9.5Ω		
V 4	6BE6	100KΩ	470Ω	0Ω	.1Ω	†2.6KΩ	†34KΩ	.2Ω		
V 5	6BE6	100KΩ	470Ω	0Ω	.1Ω	†2.6KΩ	†33KΩ	.3Ω		
V 6	6BA6	330KΩ	0Ω	0Ω	.1Ω	†34KΩ	†34KΩ	0Ω		
V 7	6BA6	150KΩ	0Ω	0Ω	.1Ω	†16KΩ	†44KΩ	0Ω		
V 8	6BA6	530KΩ	0Ω	0Ω	.1Ω	†4.7KΩ	■27KΩ	0Ω		
V 9	6BA6	67KΩ	0Ω	0Ω	.1Ω	†4.8KΩ	■27KΩ	0Ω		
V 10	6BA6	67KΩ	100Ω	0Ω	.1Ω	†2.6KΩ	†4.7KΩ	100Ω		
V 11	12AX7	550Ω	550Ω	100KΩ	.1Ω	.1Ω	100KΩ	100KΩ	0Ω	0Ω
V 12	6BA6	100KΩ	0Ω	0Ω	.1Ω	†35.5KΩ	†100KΩ	.2Ω		
V 13	12AU7	58KΩ	700KΩ	2.6KΩ	.1Ω	.1Ω	†2.6KΩ	100KΩ	1KΩ	0Ω
V 14	12AX7	33KΩ	33KΩ	1Meg	.1Ω	.1Ω	†220KΩ	500KΩ	3.3KΩ	0Ω
V 15	6AQ5	100KΩ	0Ω	0Ω	.1Ω	†450Ω	†400Ω	100KΩ		
V 16	6BA6	680KΩ	4.7KΩ	.1Ω	0Ω	†230KΩ	†110KΩ	4.7KΩ		
V 17	5V4G	INF	23KΩ	INF	650Ω	INF	650Ω	INF	23KΩ	
V 18	OA2	†4.1KΩ	INF	INF	0Ω	†4.1KΩ	INF	INF		

ALL MEASUREMENTS ON BAND # 1 - CONTROLS SET FOR NORMAL OPERATION EXCEPT AS NOTED.

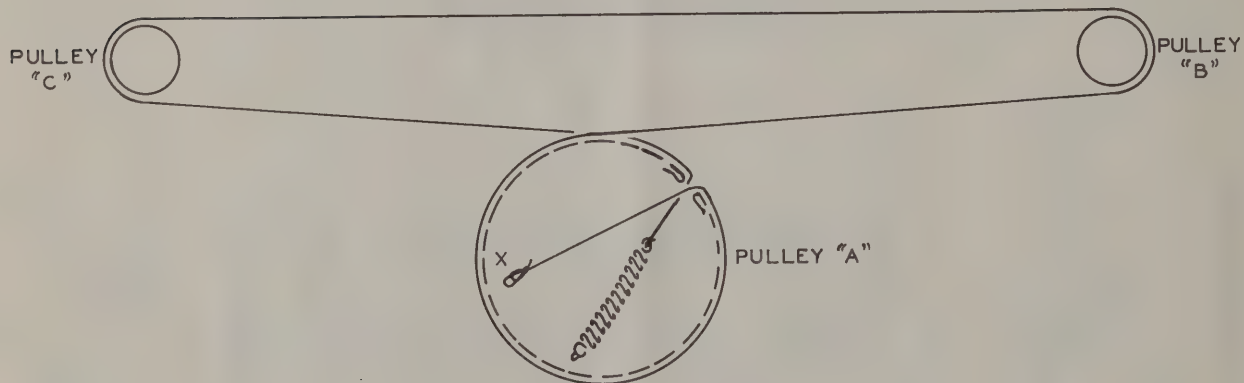
† MEASURED FROM PIN 8 OF V17

▲ POWER SWITCH IN "ON" POSITION (AC CORD NOT CONNECTED).

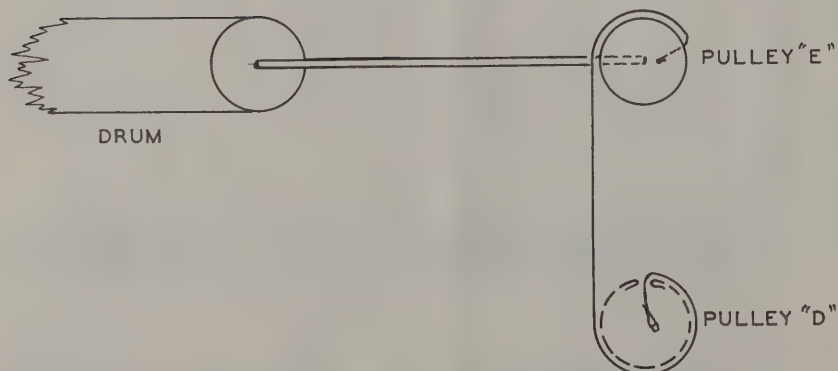
■ POWER SWITCH IN "OFF" POSITION

◆ MEASURED WITH M18 CALIBRATION SWITCH IN "ON" POSITION

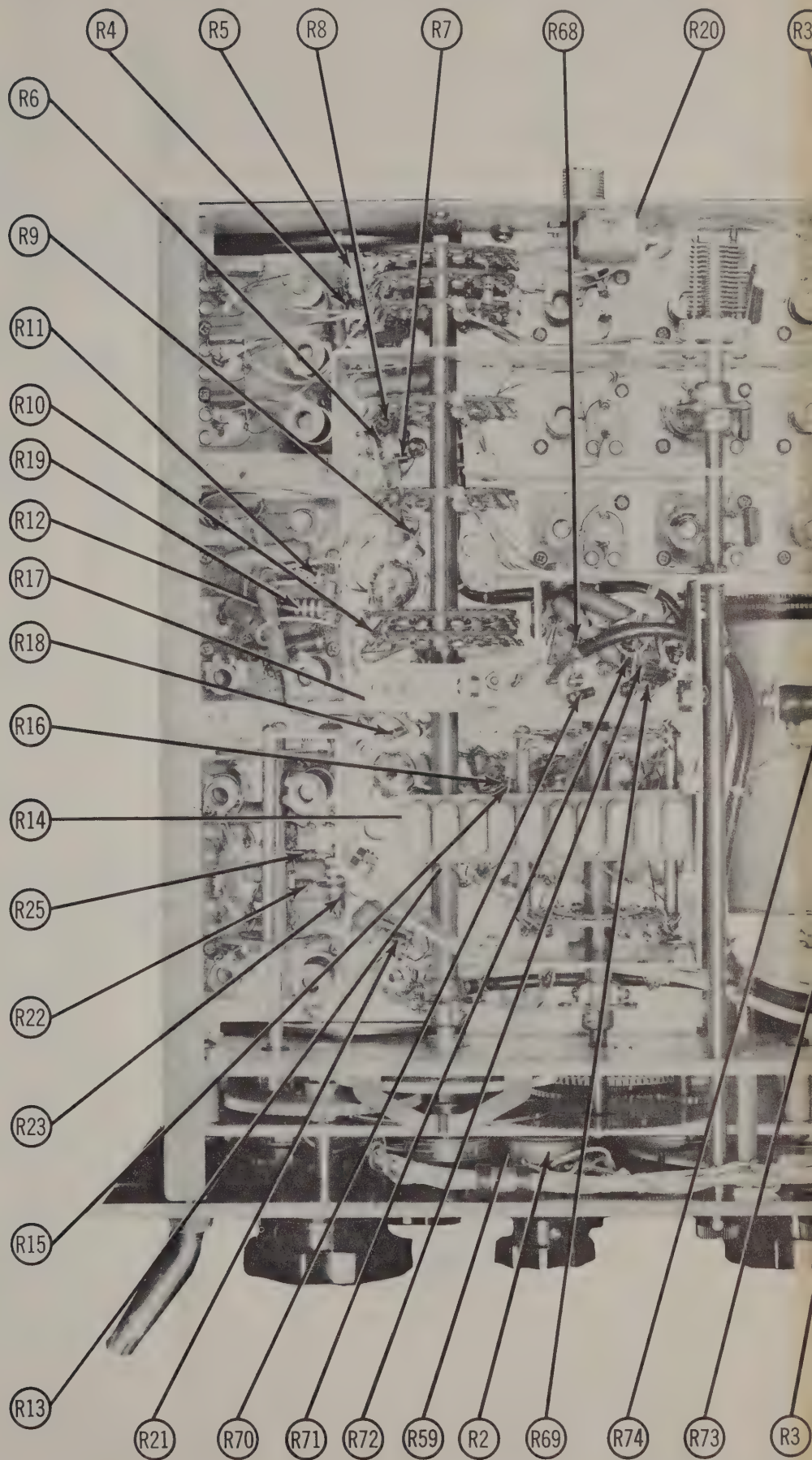
DIAL CORD STRINGING



MEGACYCLE POINTER CORD



DRUM CORD



CHASSIS BOTTO

RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AK5	1.2Meg	0Ω	0Ω	.1Ω	†18KΩ	†34KΩ	0Ω		
V 2	6BE6	2.5Ω	470Ω	0Ω	.1Ω	†3.6KΩ	†48KΩ	330KΩ		
V 3	6AK5	100KΩ	9.5Ω	0Ω	.1Ω	†50KΩ	†37KΩ	9.5Ω		
V 4	6BE6	100KΩ	470Ω	0Ω	.1Ω	†2.6KΩ	†34KΩ	.2Ω		
V 5	6BE6	100KΩ	470Ω	0Ω	.1Ω	†2.6KΩ	†33KΩ	.3Ω		
V 6	6BA6	330KΩ	0Ω	0Ω	.1Ω	†34KΩ	†34KΩ	0Ω		
V 7	6BA6	150KΩ	0Ω	0Ω	.1Ω	†16KΩ	†44KΩ	0Ω		
V 8	6BA6	530KΩ	0Ω	0Ω	.1Ω	†7KΩ	■27KΩ	0Ω		
V 9	6BA6	67KΩ	0Ω	0Ω	.1Ω	†4.8KΩ	■27KΩ	0Ω		
V 10	6BA6	67KΩ	100Ω	0Ω	.1Ω	†2.6KΩ	†47KΩ	100Ω		
V 11	12AX7	550Ω	550Ω	100KΩ	.1Ω	.1Ω	100KΩ	100KΩ	0Ω	0Ω
V 12	6BA6	100KΩ	0Ω	0Ω	.1Ω	†35.5KΩ	†100KΩ	.2Ω		
V 13	12AU7	58KΩ	700KΩ	2.6KΩ	.1Ω	.1Ω	†2.6KΩ	100KΩ	1KΩ	0Ω
V 14	12AX7	33KΩ	33KΩ	1Meg	.1Ω	.1Ω	†220KΩ	500KΩ	3.3KΩ	0Ω
V 15	6AQ5	100KΩ	0Ω	0Ω	.1Ω	†450Ω	†400Ω	100KΩ		
V 16	6BA6	680KΩ	†4.7KΩ	.1Ω	0Ω	†230KΩ	†110KΩ	†4.7KΩ		
V 17	5V4G	INF	▲23KΩ	INF	650Ω	INF	650Ω	1NF	▲23KΩ	
V 18	OA2	†4.1KΩ	INF	INF	0Ω	†4.1KΩ	INF	INF		

ALL MEASUREMENTS ON BAND # 1 - CONTROLS SET FOR NORMAL OPERATION EXCEPT AS NOTED.

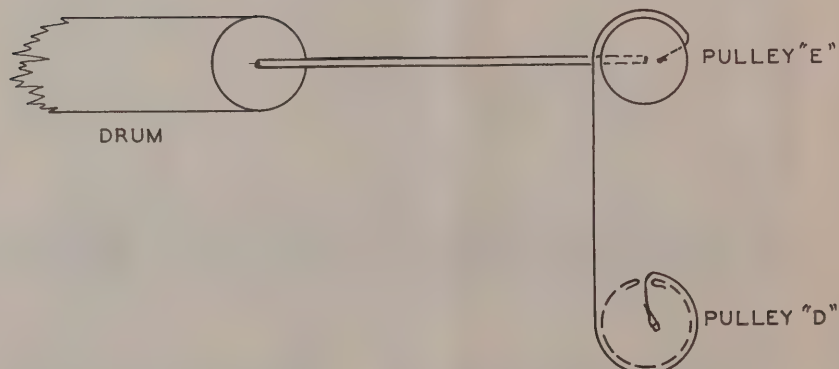
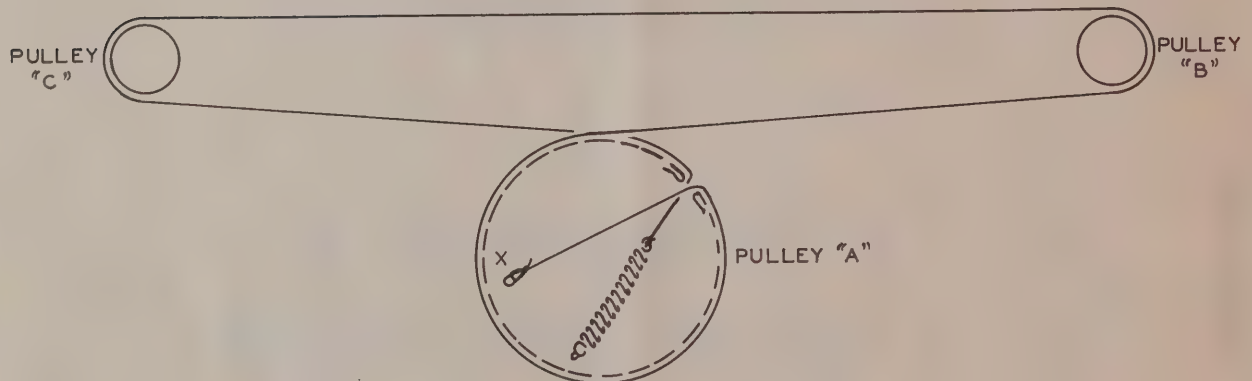
† MEASURED FROM PIN 8 OF V17

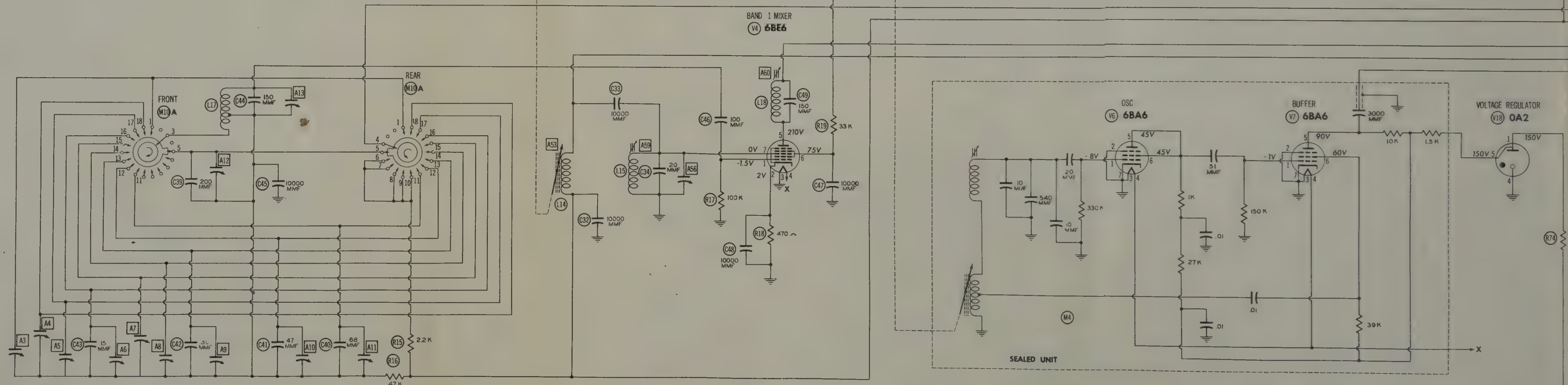
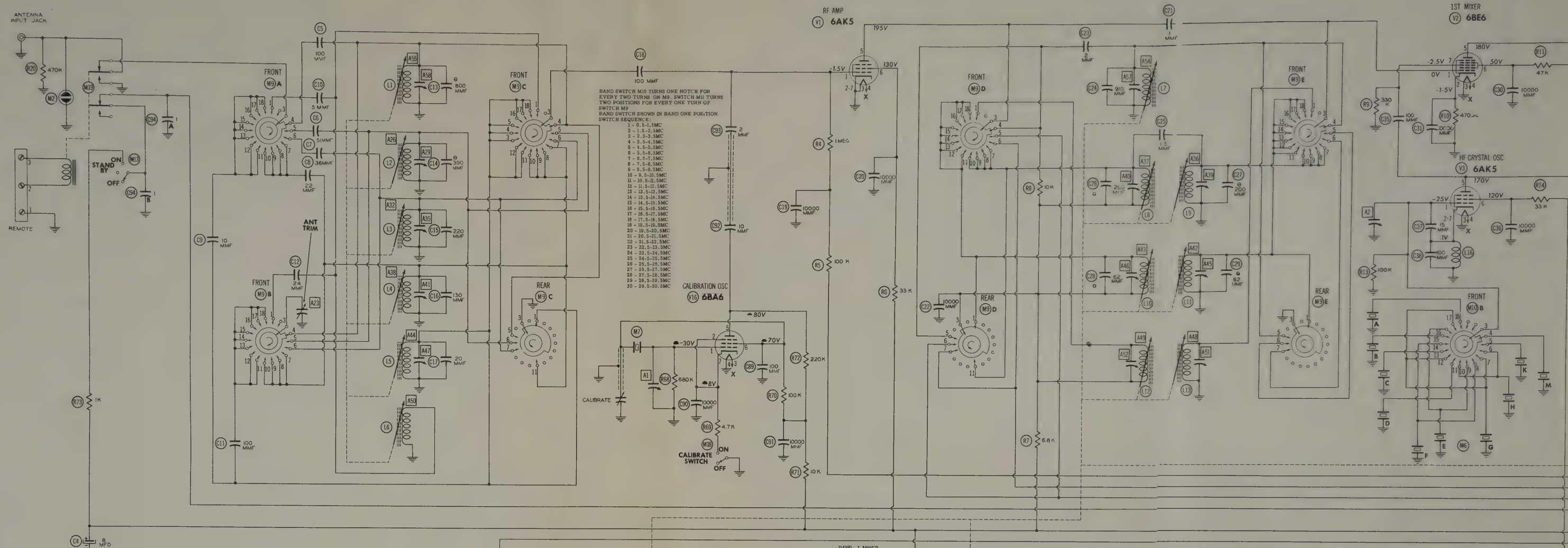
▲ POWER SWITCH IN "ON" POSITION (AC CORD NOT CONNECTED).

■ POWER SWITCH IN "OFF" POSITION

◆ MEASURED WITH M18 CALIBRATION SWITCH IN "ON" POSITION

DIAL CORD STRINGING

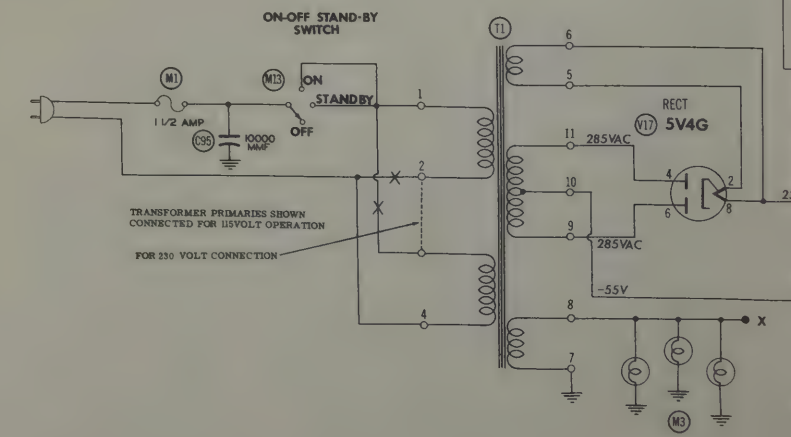


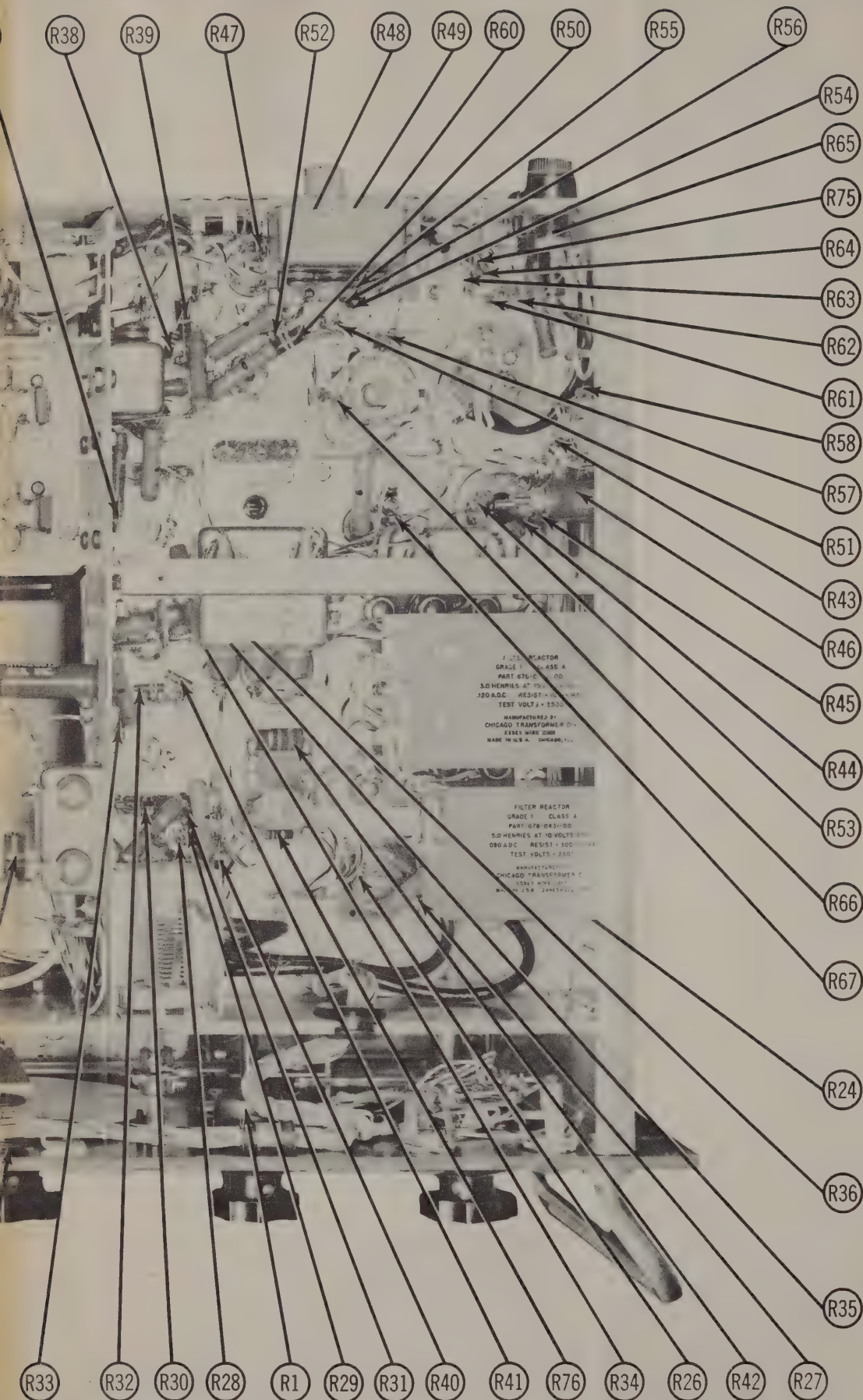


1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from model pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of $\pm 15\%$ in voltage and resistance readings.
6. Volume control at maximum; no signal applied for voltage measurements.

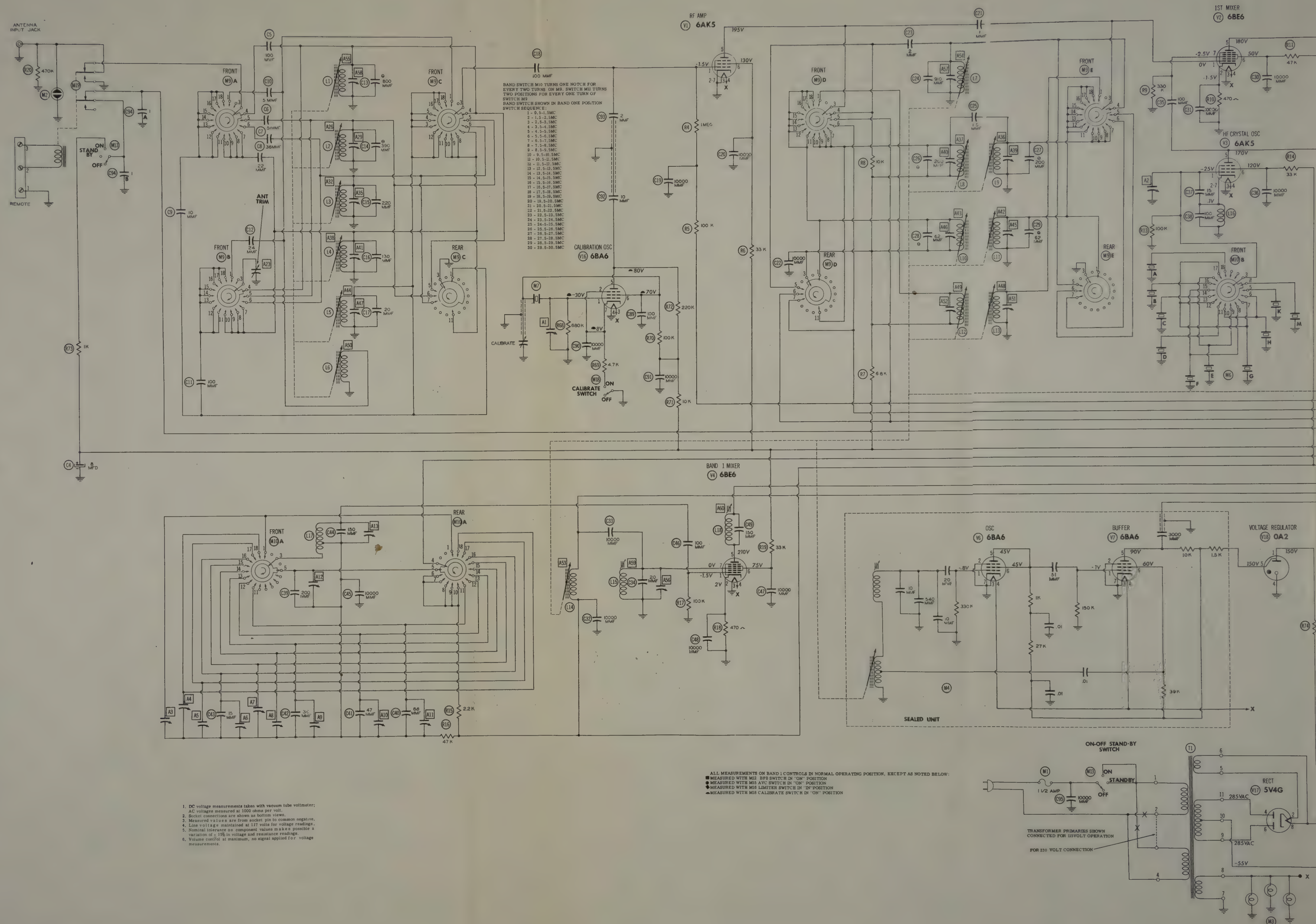
ALL MEASUREMENTS ON BAND 1 CONTROLS IN NORMAL OPERATING POSITION, EXCEPT AS NOTED BELOW:

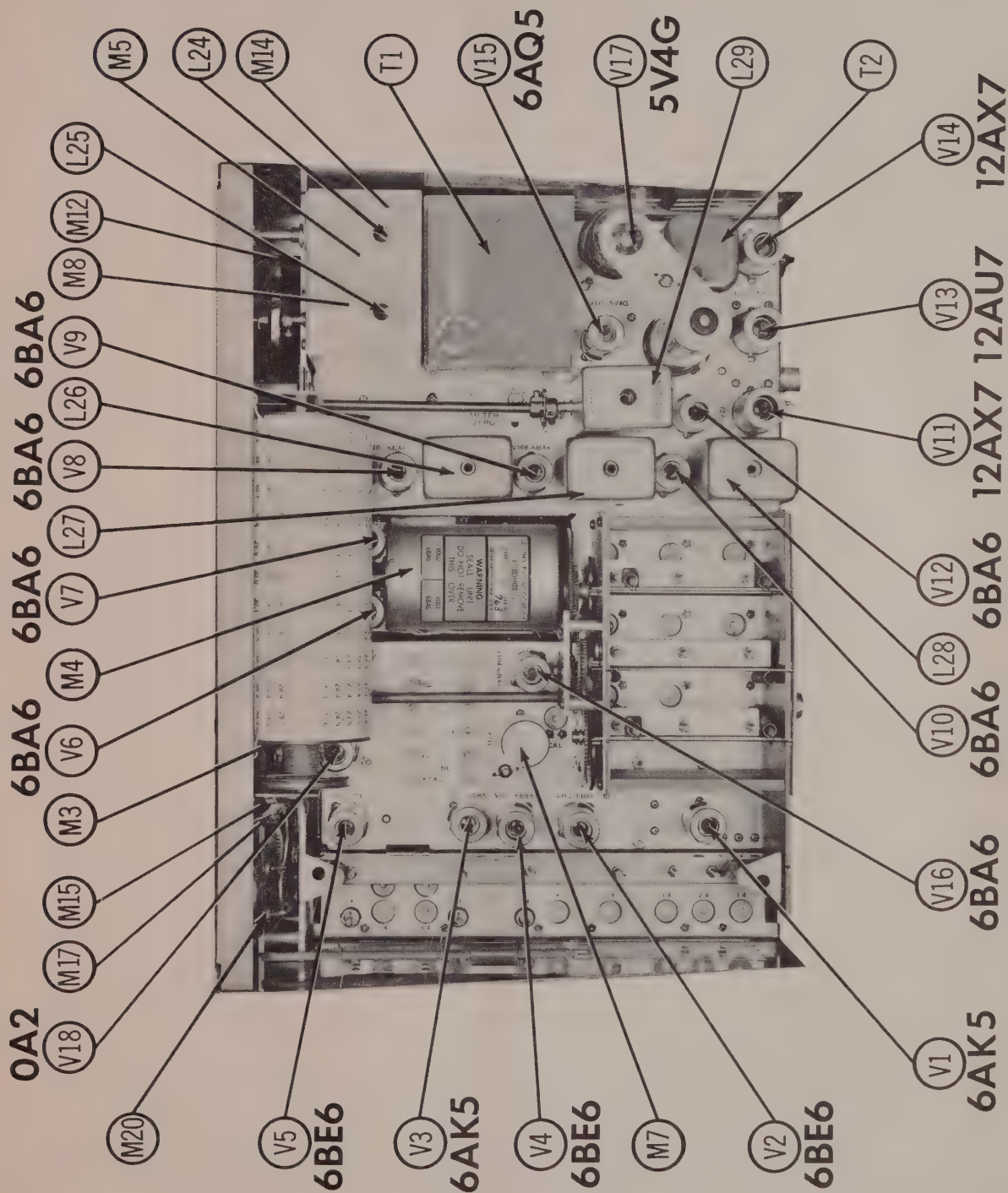
- MEASURED WITH M10 RPS SWITCH IN "ON" POSITION
- MEASURED WITH M10 AVC SWITCH IN "ON" POSITION
- MEASURED WITH M10 LIMITER SWITCH IN "IN" POSITION
- MEASURED WITH M10 CALIBRATE SWITCH IN "ON" POSITION



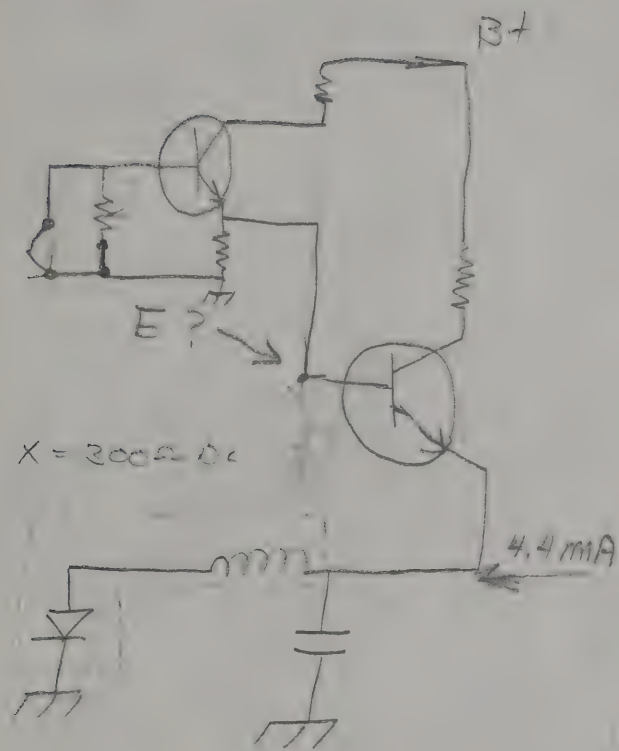


VIEW-RESISTOR IDENTIFICATION





CHASSIS TOP VIEW TUBE PLACEMENT



NORTHWEST NATURAL GAS COMPANY

INFORMATION

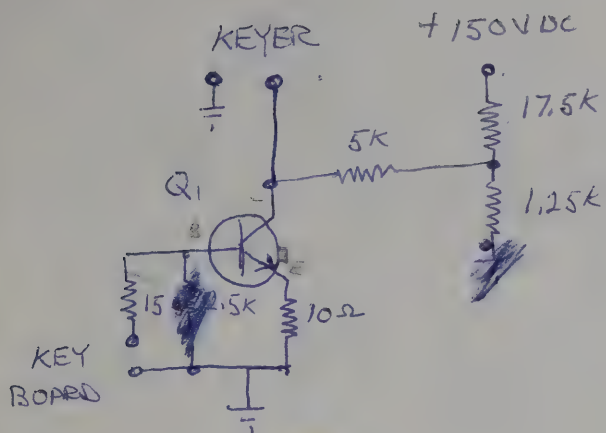
Date _____

NAME _____

ADDRESS

FORM 3479

OVER



$\frac{1}{2}$ WATT RESISTORS

ANY SIGNAL NPN TRANSISTOR

NORTHWEST NATURAL GAS COMPANY

INFORMATION

Date _____

NAME

ADDRESS

FORM 3479

OVER

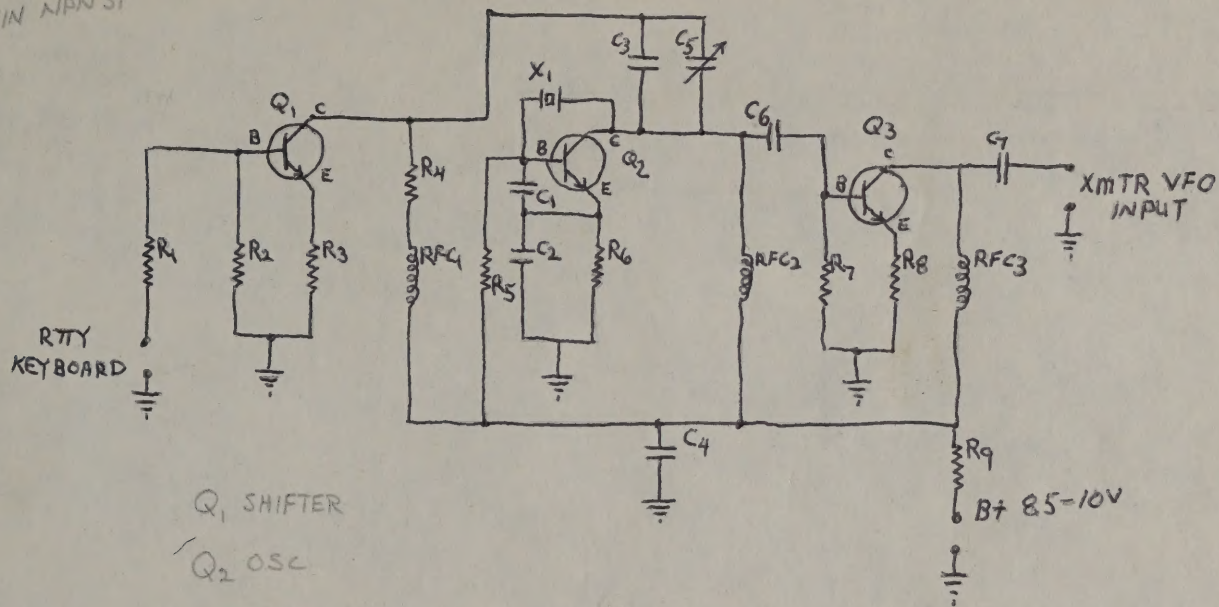
Q₁ 95221-2 ARVIN NPN Si
 Q₂ 95221-2 ARVIN NPN Si
 Q₃ 95226-4 ARVIN NPN Si

X₁ 4625 KHZ

RFC_{1,2} 2.5 mh
 RFC₃ UNKNOWN

R₁ 15
 R₂ 2.5K
 R₃ 10
 R₄ 5K
 R₅ 82K
 R₆ 330
 R₇ 10K
 R₈ 47
 R₉ 100

C₁ 330
 C₂ .05mf
 C₃ 150
 C₄ 500mf
 C₅ 4.5-30
 C₆ 150
 C₇ 150



COLLINS RADIO COMPANY
CEDAR RAPIDS, IOWA



DALLAS NEW YORK WASHINGTON BURBANK
OTTAWA RIO DE JANEIRO TORONTO LONDON